INCLUDING ANNUAL INDEX

WORLD CROPS

embracing

AGRONOMY, HANDLING, PROCESSING, STORAGE AND PROTECTION
SOILS, CHEMICALS, IRRIGATION, ENGINEERING AND ECONOMICS

UNIVERSITY
OF MICHIGAN
DEC 10 1953
FORESTRY
LIBRARY

Scott Agricultural Laboratory, Kabete, using 'DIPAC' brand 'Swingfog' DDT Fluid on millet

VOLUME 5, No. 12 DECEMBER 1953

A Publication of The Leonard Hill Technical Group

Marks

THE SPOT

for MODERN INSECTICIDES AND HERBICIDES

As basic manufacturers for over 75 years we offer the PUREST and MOST ACTIVE BASIC CHEMICALS for the formulation of modern insecticides and herbicides, for instance:—

DNOC (dinitro-ortho-cresol).
The purest commercial grade (m.p. 84°C) of lowest mineral acid content (max. 0.25%). Also Special Grade (m.p. 85°C, mineral acid less than 0.05%) at only slightly higher price.

DNOC AMINE SALT. The safer DNOC Weedkiller. Soluble, non-clogging, less toxic to humans, cheaper and safer to use. While more effective, this salt has the lowest mammalian toxicity of any DNOC weedkiller.

DNOC SELECTIVE WEEDKILLERS to specification.

DNOC WINTER WASHES to specification.

DNOC OIL EMULSION for **LOCUST CONTROL**
Extensively used by Red Locust Control Commission with exceptional results. Has given 99% control of adult locusts at ½ gallon per acre.

DNBP (dinitro-sec.butyl-phenol). Ammonium salt in alcohol. Amine salt in water.

DNBP SELECTIVE WEEDKILLERS to specification. For Peas and other legumes, also for Flax.

DNAP (dinitro-amyl-phenol).

DNAP SELECTIVE WEEDKILLERS to specification. Non-corrosive **Potato Haulm Spray.**

For **purest** basic materials and **most active** formulations send us your enquiries!

A. H. MARKS & CO. LTD. Chemical Manufacturers, WYKE, BRADFORD

Marks

TAS/MB4

WORLD CROPS

Editor: Sir Harold A. Tempany, C.M.G., C.B.E., D.SC., F.R.I.C.

Vol. 5 No. 12 **CONTENTS** DECEMBER 1953

EDITORIAL COMMENT:
Development and the West Indies; Farm Adoption; Fertilisers in South America; Mechanisation in India; Control of Rushes; Living Space; Predators and Insecticides; Friesians Again Triumphant; The Weed Control Conference; The Smithfield Show 477

Agricultural Planning in East Africa—*A. C. Barnes*, C.M.G. 481

The Reclamation of Land Flooded by Sea Water—*Prof. G. Deloffre* 485

The Port of London 489

Continuous Cloches for Early Crops—*J. L. H. Chase* 494

The Effects of Organo-Mercurial Fungicides on Sugar Cane Cuttings 497

Disinfestation of Ships' Holds 499

Red Spider Mite Control 501

Some Italian Impressions 502

Research Developments: Foliar Spraying for the Application of Plant Nutrients to Crops 503

New Books 504

Grain Drying, Storage and Handling Course 505

Farm Machinery 506

World Crop Reports 507

Index for 1953 510

Published monthly by Leonard Hill Limited, Stratford House, 9 Eden Street, London, N.W.1, England (Tel. Euston 5911)

Subscription rates : *1 year 8 dollars, 3 years 20 dollars, paid in advance*

ASSOCIATION OF AGRICULTURE

The Association of Agriculture exists to create a better understanding of farming, rural life and the countryside, especially among town-dwellers.

Material now available includes :—

MAP OF THE PRINCIPAL SYSTEMS OF FARMING IN GREAT BRITAIN. A new and simplified map showing the generalized distribution of farming systems in Great Britain has been compiled by Professors L. Dudley Stamp and Keith Buchanan for the Association of Agriculture and the National Federation of Young Farmers' Clubs.

In eight colours. Size 42in. x 27in. Price **7s. 6d.** (post free)

A 12-PAGE ILLUSTRATED BOOKLET by Professor Keith Buchanan on "The Distribution of Systems of Farming in Britain," gives an introduction to, and a detailed description of, the systems shown on the Wall Map.

Price **1s.** (post free)

FARM ADOPTION BY POST. Descriptions of eight typical British farms, selected on a regional basis. Each folder includes a photograph of the farm, a county map, a map of fields and buildings and details of soil, cropping, livestock, labour, markets, geography and history. Progress Reports follow three times a year.

Price **5s.** per farm (post free)

Full particulars of the above and other activities from

THE ASSOCIATION OF AGRICULTURE

238 - 240 ABBEY HOUSE · 2 VICTORIA STREET

LONDON S.W.1

Our Front Cover picture shows the Scott Agricultural Laboratory, Kabete, using 'DIPAC' brand 'Swingfog' DDT Fluid on millet.

Maize, sorghum, rice and many other crops of the same type are attacked by insect pests very often at a late stage of growth when control is difficult. Normal spraying methods cannot be adopted as damage to the crop from the machinery itself would be too great. Tractor or spraying machinery wheels could often do more damage to crop yield than the pest itself. In such cases, 'Swingfog' offers an excellent alternative method as it is mobile, can be carried through the crop causing no mechanical damage.

Isolated areas of cereals can be treated at very low application cost, thus bringing the control of insect pests within reach of the smaller farmer in even poorly developed areas.

Correct formulation of insecticidal fluid is essential under such conditions where scientific supervision cannot be given and 'foolproof' insecticides are an absolute essential. Pan Britannica Industries Ltd. of Waltham Abbey, Essex, have studied all these problems of application and now have the following fluids available for 'Swingfog' application.

'DIPAC' brand 'Swingfog' DDT Fluid to control caterpillar, thrips, leafhoppers, etc.

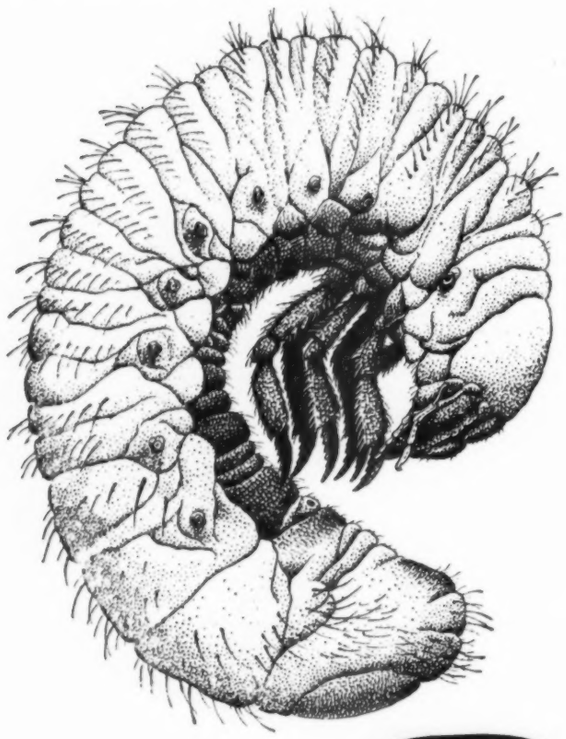
'DIPAC' brand 'Swingfog' BHC Fluid to control aphis, caterpillar, thrips, stem-borer, etc.

'DIPAC' brand 'Swingfog' Lindane Fluid to control flies, mosquitoes and other domestic pests.

'DIPAC' brand 'Swingfog' Toxaphene Fluid to control a wide range of cotton pests.

All these fluids are being tested extensively in many countries of South America, Africa, Asia and the Far East and a great deal of information is being accumulated. This will all add to the present knowledge and enable 'DIPAC' fluids to be recommended for a wider variety of crops in many more countries.

White Grub (*Phyllophaga and Melolontha spp.*)



NEW fighting weapons for agriculture

The majority of agricultural pests are doomed, now that two new Shell insecticides, *aldrin* and *dieldrin*, have entered the battle to grow more food.

Of these new pest destroyers, *aldrin* is the one to use against white grubs. Dust *aldrin* over the soil before sowing cereals, root crops including potatoes, or grasses; or spray the soil with *aldrin* during cultivation.

In the soil *aldrin* retains its insecticidal potency for long periods: it will not taint a crop: it is alkali-stable.

aldrin

dieldrin

FULL INFORMATION
FROM YOUR LOCAL
SHELL COMPANY

are SHELL insecticides

Editorial Comment

Development and the West Indies

THE report of five British industrialists who visited Jamaica, Trinidad, British Guiana and Barbados some months ago has recently been published (Colonial Office No. 294, 1953) and it is clear that the problem of prosperity for these colonies cannot easily or quickly be solved. The growth of industrial development must depend upon increases in internal consumption, and for this the necessary enlargement of purchasing power must 'come in the main from an expansion of agricultural production, which we feel is feasible.'

Soap manufacture is already established in the British West Indies; margarine manufacture is finding its feet. For both these industries expansion is held up today by the shortage of coconut oil. Coconut cultivation was sadly neglected before the war. There was no new planting, understandably enough, for the price of copra was so low that no producer in the West Indies could hope to avoid loss. The economic climate has changed from perpetual depression to sunny conditions, but the rate at which the coconut acreage is increasing is still too low. An additional 15,000 acres has been recommended in Jamaica alone. The ability of the coconut to thrive on land that is unsatisfactory for other agricultural crops is an important asset for this traditional product of the West Indies. However, there would seem to be much room for improved methods of processing the nuts. Farm processing is often practised and this is highly wasteful; in British Guiana alone 150,000 gal. of oil could be saved if factory processing was the universal method. Even so, few of the factories can be called efficient; the British mission suggests that one modern plant in one or other of the colonies could utilise all the copra produced in the area more efficiently and economically. Few of the soap plants in the West Indies have an efficiency approaching European standards. Glycerine recovery is not attempted at most of them. The few margarine factories, undoubtedly because they are new, are more modern, but production costs are high because the scale of operations is so small.

Obviously a notable opportunity to raise the standard of living in these colonies exists here. A much bigger coconut acreage, more efficient oil and fats extraction, and more modern soap-making processes—simultaneous attention to all these branches of the industry could greatly increase the benefits already received from the coconut. Even though Malaya's fortunes have been dominated by rubber, the coconut there has long made an important contribution to its export trade; in the West Indies a similarly important position for this crop could be established.

Another agriculturally-based opportunity for development in these Carribean territories is the expansion of citrus fruit production. This, too, is closely bound up with efficient processing, the production of orange juice concentrates and high standard canned fruits. Ten thousand more acres of citrus fruit have been recommended for Jamaica, and new planting is proceeding on a considerable scale. Pineapple canning is about to be started in the area and its prospects are particularly promising. But the mission's report rightly insists that minimum standards must be laid down for all fruit canning if this newly developed trade is to hold its own when world conditions become more competitive. The new plantations will merely grow to produce unwanted surpluses if low standard products emerge from the canneries. Crops alone are not enough.

Farm adoption

LAST month we had occasion to comment on the effect of the dissociation of urban industrialisation from rural production in Russia and endeavoured to point out how in totalitarian countries this had brought about a disastrous lack of understanding of the role and the importance of the rural worker and his way of life on the part of the industrial worker and the effect this may have on the economy of the community. It is not, however, in Communist countries alone that this tendency is to be seen. Indeed, in Britain itself, as well as in most other countries in the civilised world where industrialisation has been developed, this lack of mutual understanding between town and country is a dangerous and disquieting feature, leading to mutual antagonism and distrust and disregard of the fact that the two ways of life are both inevitable and essential components of any social system.

To combat this disastrous drifting apart, the Association of Agriculture in Britain has introduced a project which is known as the farm adoption scheme for schools. Under this scheme, urban schools are invited to adopt a farm in a particular part of the country. By means of photographs, contour maps and periodical progress reports from the farmer himself, lessons in the school are related with the realities of life and work on the adopted farm. The children are encouraged to think where and how the food they eat is produced and how town and country each depend on the other for survival. Wherever practicable, these lessons are supplemented by periodical visits to the farm itself, where they can see for themselves the various operations in progress.

Recently, the working of this scheme has been shown in a film which links one school in the East Riding of Yorkshire with a farm in the lovely wold country of that area. The film has been sponsored by the Shell and B.P. Corporations and made by Randon Film Productions. It is admirably contrived; the contrasts between the life of the school, the conditions in the back streets of an industrial town and the life of the Yorkshire countryside are most effective, while the general atmosphere emphasising as it does the one-ness of these varying aspects of national life is really moving.

To us this movement seems worthy of the highest praise and encouragement and wherever the cleavage between urban industrialisation and the life of the countryside is becoming apparent it is worthy of attention by the thoughtfully minded as a means of avoiding a danger which is none the less real because it is a commonplace sequel of what is commonly occurring.

And this applies not only to developed countries, but also to all regions, no matter in what country or climate, where the growth of population is causing attention to be turned to industrialisation as a means of diversifying occupations and finding employment for increasing numbers of people who can no longer find the means of existence in agricultural work.

Fertilisers in South America

THE world contributions of Chilean nitrates and Peruvian guano are so well known that it provides something of a shock to learn from a new FAO publication (*Fertiliser Production, Distribution and Utilisation in Latin America*, 1953) that the general use of fertilisers is seriously under-developed in South American countries. Vigorous action is needed and a threefold programme is suggested (1) to increase fertiliser supplies at reasonable cost, (2) to establish a basis of knowledge for fertiliser practice, and (3) to educate the farmers in efficient use of fertilisers. The total phosphate consumption of the Latin American countries is rather less than that of Belgium and Luxemburg, but for the well-organised guano production of the Western countries—Chile, Ecuador, Mexico and Peru—South American usage of phosphatic fertilisers would be far smaller still. Despite the presence of the famous Chilean nitrates, the consumption of nitrogenous fertilisers is also small—under half that of Britain or about the same as that of Egypt! The use of potash is naturally small, for the recognition of this nutrient's importance must always await the development of nitrogen and phosphate applications. Reserves of potash salts are known, but they have not been exploited—the potash available as Chilean potash nitrate and in guano has so far been sufficient.

The extent to which the potentialities of fertilisers have been neglected is even greater than this brief summary suggests, for only four of the 20 countries of Latin America account for 75% of the total consumption—Peru, Chile, Brazil and Cuba. Peru uses over 60 times as much fertiliser per cultivated hectare as Argentina; this is perhaps a harsh comparison, for Argentina crops 15 times as much land and does not possess the natural fertiliser reserves enjoyed by Peru. The statistical average for phosphate and potash per acre in Nicaragua is ' less than 10 grammes of nutrient per hectare '! Nevertheless, populations are growing rapidly in Latin America and soil fertility levels are known to be declining seriously. The plant food budget is hopelessly insolvent when the export of nutrients in food is considered. The export of agricultural products from Argentina is equivalent to an annual export of 250,000 tons of nitrogen, 127,000 tons of phosphoric acid and 56,000 tons of potash; that is to say, over three times, half as much again, and nearly twice the total provision of these respective nutrients for the whole of Latin America.

One stark conclusion emerges from the FAO report. There is almost everywhere a sharp disparity between the prices of fertilisers and the prices farmers receive for their produce. The former are too dear, the latter too low. Economic changes as well as technological progress will be needed to induce a significant expansion in the use of fertilisers in most of these countries.

Mechanisation in India

UP till two years ago there was virtual unanimity in India on the need for increased mechanisation of agriculture. It was almost universally held, and almost certainly correctly, that only by means of mechanisation could crops in India be cultivated over areas sufficiently large as to give returns capable of meeting the demands of the rapidly growing populations and at the same time keeping prices down to levels within the capacity to pay of the bulk of the population.

Latterly, however, there seems to have been a considerable reorientation of opinion in India on this subject and a number of Indians in responsible positions are reported to have expressed the view that mechanisation of agriculture under Indian conditions is undesirable and cannot be productive of benefit. In condemnation of mechanisation some rather amazing statements are reported to have been made. Thus the Minister of Agriculture of one Indian state is alleged to have stated that tractors have turned 60% *of the land in the United States of America* into a barren waste! Another similarly highly placed Minister is reported to have said that mechanisation has been tried and failed ' partly because there is something wrong with it '! Apparently, such views are not universally held, and it is reported that Dr. Deshmuk, Minister of Agriculture in the Central Indian Government, is doing his best to counter them, unfortunately with scant success.

What is at the root of this at first sight inexplicable volte face and this extraordinary campaign of misrepresentations is apparently the fear that mechanisation may, by reducing the number of labourers needed for agriculture, create unemployment. Alarms of this description are common in the history of the past. Indeed, in various spheres, both industrial and agricultural, fears of unemployment have almost invariably been expressed when mankind has invoked mechanical power to lighten the burden of effort. Usually the event has proved them groundless and the benefit has been visible in the shape of greatly augmented and cheapened production. In this case the vitally important step seems to be to encourage industrial development to the maximum possible degree, a policy which in justice it must be said the Government of India favours.

It cannot be stated that such fears are entirely groundless, for who can deny that the extraordinary fertility of the Indian population, if it proceeds unchecked, must infallibly lead to a time when India will be unable to produce sufficient food to nourish all her children. Meanwhile, however, the potential production of food is a very long way below what is capable of achievement and the attainment of a greater efficiency here must be a first aim. It is dangerously myopic to fail to see that in the attainment of this essential goal, mechanisation by efficient and appropriate means is among the most potent of weapons, and to deny this and, worse, to attempt to influence uninstructed popular opinion to the detriment of mechanisation by misstatements or misrepresentation. Indeed, in the last resort the chief hope of salvation, not only of India, but of the entire human race, lies in the regulation and control of population increase.

Control of rushes

SCOTTISH experiences in rush control of pastureland have recently been surveyed by J. Macfarlan (*Scottish Agriculture*, **33**, 2, 74, 1953) and the immense contribution made by modern hormone-type weedkillers can hardly be exaggerated. Both the common rush and spret (or jointed rush) thrive on land that is poorly drained and of low fertility. Annual cutting and fertiliser treatment bring about slow eradication at the best; ploughing and reseeding has previously been the only sure treatment, and in many places these are costly or impracticable solutions. Rush control has been transformed by the advent of MCPA.

The first tests of 1948 were conducted with 'Agroxone' in powder form. If rush eradication was not complete, the results were, at any rate, highly encouraging. The full potentialities of control did not emerge until liquid form 'Agroxone' and low-volume sprayers were available; then rapid and complete kills of rushes were obtained, with freedom from reinfestation in following seasons. Fairly early spraying has been found to be preferable—from about mid-May to mid-July—but to be earlier still is not advantageous, as there is insufficient new rush growth to absorb the spray readily. Heavy rain just before or just after spraying has tended to reduce the completeness of control, but if the foliage is dry when spraying takes place and there are a few hours of dry weather immediately afterwards good results are assured. Pastureland treated once in 1950 has shown no regrowth of rushes since so long as reasonable standards of grassland management have been followed. At an average spraying cost of between £2 and £3 per acre there cannot be many cultivation operations offering more attractive rewards.

However, the real benefit of rush eradication is not secured unless it is associated with liming and fertiliser treatment. It is one thing to destroy the rushes; another to encourage grasses to take their place swiftly. Clovers as well as grasses will readily take over if the level of fertility is raised.

Most of the Scottish work, though not all, has been carried out in the western and wetter areas. Here permanent pastureland that is infested with rushes can carry only a fraction of the stock carried by rush-free land. The economic losses due to rushes are enormous; the ease and low cost with which these losses can be removed from the national farming budget cannot be too widely known.

Living space

FUNDAMENTAL small-scale investigations are somewhat a rarity these days in agricultural science. Some experiments recently reported from the Botany Department of Manchester University (L. G. G. Warne, *Nature*, **172**, 506, 1953) on the effect of spacing distances upon garden beet growth deserve wide attention. As is well known, there is an optimum plant population per acre for most root crops, and especially so for the beet family. It is commonly assumed that the distance between plants is a critical influence because competition for light, water and nutrients increases as the interplant spacing decreases. These assumptions have been put to the test of experiment, using garden beet as the crop, and it now seems that there is little evidence to support them. Measurements of the ratio of top and root weights for various spacings in three seasons do not suggest that competition for light is a highly important factor; only in a year of low sunlight is there any definite indication that mutual shading by close-growing plants reduces photosynthetic efficiency. Still less did the experiments show that competition for moisture affected growth rate. In seasons of low rainfall the yield effects of close spacing were the same as in seasons of abundant rainfall. Leaf analysis failed to show that nutrient contents were lowered by close spacing; in one experiment there was an indication of nitrogen shortage, but this was under non-manured conditions. With properly fertilised soils nutrient shortages did not occur as the distance between plants was reduced.

Nor was there any evidence that close spacing reduced growth and yields through physical congestion; even at the closest spacings studied there was no plant deformation by mutual pressure. Nevertheless, the general fact remains. It could not be put better than in the opening sentence of the original communication, 'that close spacing restricts the growth of most plants is so obvious as not to require experimental proof.' But the apparently obvious explanations that have long been accepted—competition for light, water and food—do not seem to be the principal causes at all; at their maximum effect they are only slightly contributory. The answer lies deeper. Once again we are forced to reflect that we still know far too little about fundamental 'laws' of plant growth, that most of our knowledge is empirical or technological. Is the principal restriction upon plant growth in close-spaced conditions due to the effect of retardant trace substances emitted by plants during growth? Nature, after all, has devised other antibiotics to suit her purposes.

Predators and insecticides

IT has long been recognised that in the control of insect pests of crops, predators and parasites can play an important part and there has been to some extent a conflict of opinion between those economic entomologists and their allies, the spraying machinery experts, who pin their faith to insecticides as the main weapon for the control of the insect enemies of crops, and those who are inclined to place their main reliance on natural enemies for effecting the necessary control. A good deal, of course, depends on the status of the cultivator. Where, as in many parts of the tropics, the crops are grown on smallholdings by peasant cultivators with little in the way of resources, financial and otherwise, behind them, it is but natural that reliance should mainly be placed on natural agencies, since the procurement of insecticides and the means of applying them is usually beyond the means of the peasant cultivator, except in cases where the organisation of peasant cultivation into some form of group farming has been effected. A number of examples, in fact, exist of cases in which the control of serious pests of crops has been effected by the introduction of their insect enemies. We might refer readers here to the article on this subject by Mr. R. J. Lever, which appeared in WORLD CROPS, Vol. 3, p. 430.

On the other hand, predators and parasites can never be

completely controlled by natural means inasmuch as they depend on the pest itself for their existence and the disappearance of the pest ultimately, therefore, may entail disappearance of its natural enemy owing to the disappearance of its food supply, and this in itself is a reason for not placing entire reliance on parasites and predators and preferring in their place the use of insecticidal washes, sprays and dusts. The use of these, however, often entails destruction of existing beneficial insects and for this reason systemic insecticides have been hailed as a remarkable advance, since they have been shown to be effective, *e.g.* in destroying aphids which attack crops, but do not harm the ladybirds which prey on them. It is, however, to be noticed that this freedom from damage only applies to insects which are exclusively carnivorous. When predators are only partially carnivorous and take their food partly from vegetable sources immunity from damaging action is absent.

The subject of insect population balance and chemical control was recently discussed in a paper read before the Crop Protection Panel of the Society of Chemical Industry by Dr. Elsie Collyer, of the East Malling Research Station, in which she illustrated her remarks by special reference to the fruit tree red spider mite, where frequent spraying needed to bring about effective control has caused high mortality among the parasites and predators of the mite.

Dr. Collyer concluded her paper by pointing out that only the study of different spraying programmes over a period of years can give the full answer to problems of this type. It should not, in any case, be assumed that because predators may not give full control of a pest (in this case the red spider) in commercial orchards it is justifiable to ignore them. Rather is it the business of the entomologist to discover the conditions which enable beneficial insect species to survive and round this information to endeavour to build spraying systems which will control particular pests and will not at the same time make others worse.

Friesians again triumphant

AT the British Dairy Show held at Olympia in London on October 27-30, the British Friesian breed for the sixth time in succession and for the fifteenth time since 1922 triumphantly vindicated its claim to be the most productive breed of dairy cattle, having won the Bledisloe trophy in the interbreed competition as well as the supreme individual championship; the latter was carried off by Smallburgh Brenda, exhibited by Smallburgh Farms Ltd., of Norfolk.

As usual, the supremacy of the Friesian breed was closely contested, its chief rival being the Ayrshire breed, which actually won the British Dairy Farmers Association's cup for the breed society showing the best exhibit of six cows as judged by inspection after qualification in milking trials, the Friesian breed in this case being the runners-up and obtaining the reserve award.

The total entry of cattle exceeded the number recorded in 1952 by 79, when it will be remembered foot-and-mouth disease curtailed the movement of animals to London. Apart from dairy cattle, the show provides for the display of all classes of dairy produce, including butter and cheese, as well as classes for poultry, pig products and honey, while the trade exhibits included the enormous range of machinery for milking and for handling and bottling milk, making ice cream and a hundred other applications. It provided, in fact, a complete conspectus of all the different aspects of the dairy industry. As a whole the show must be conceded to have been as usual an unqualified success.

The Weed Control Conference

THE first British National Weed Conference, held at Margate from November 2-5, is conceded on all hands to have achieved a considerable success.

The conference was organised by the Weed Control Joint Committee, which is an *ad hoc* body formed as the result of a meeting at the Ministry of Agriculture in November 1952, on which the Ministry, the Agricultural Research Council, the National Farmers' Union and the Association of British Insecticide Manufacturers are represented.

The growth in importance of weed control by chemical methods of recent years has led to the holding of numerous conferences and meetings at which the subject has figured prominently, but this is the first of such gatherings on a national scale which dealt exclusively with weed control problems. Indeed, that such a gathering was possible is testimony to the remarkably rapid development which this subject has undergone of late years. The conference met under the Presidentship of Sir James Scott Watson, Chief Agricultural Adviser to the Ministry of Agriculture, while the numerous delegates who attended included representatives of all the British research stations and university departments of agriculture engaged on research on these particular aspects, and of scientific staffs of the numerous commercial firms which manufacture products of this type and representatives of the National Farmers' Union.

The scope and range of the papers and discussions was very extensive, having regard to the limitations imposed by the subject under consideration, while the practical aspects and applications were throughout kept prominently in view. The subjects dealt with included not only weed control in agricultural and horticultural crops but also such diverse aspects as weed control on grasslands and pastures and in forestry, on roadside verges and in farm ditches, while research reports related to weed control in a number of crops as well as control of a number of specific weeds.

At the conclusion of the conference the opinion was expressed that its success made desirable the setting up of a national weed control council whose business would be the organisation of similar conferences in the future, as and when the need for them should arise, and it is understood that steps with this end in view are actually in progress.

The Smithfield Show

THE Annual Smithfield Show and Agricultural Machinery Exhibition will take place at Earls Court between December 7 and 11 this year. As usual, interest centres more particularly in the machinery section of the exhibition and many firms of agricultural machinery makers make this the occasion of introducing to notice new models and new machines on which they have been at work. We shall hope to include a report of the show in our issue for January.

Agricultural Planning in East Africa

A. C. BARNES, C.M.G.

In this article, Mr. A. C. Barnes, who has recently visited East Africa, discusses some of the problems which must be confronted and solved if the potential of agricultural development in that territory is to be achieved.

IN the course of a recent investigation into the possibilities of expanding the production of cane sugar in the East African territories a number of matters emerged which are important to general questions of crop development in such countries.

Recent history

Until quite recently the study and establishment of agricultural enterprises have been conducted on random rather than planned lines and in many cases have been largely related to exploitation for quick profits or to meet urgent needs, rather than to systems of permanent land utilisation of a stable and enduring nature. The opening up of eastern equatorial Africa has coincided with a period of tremendous progress in the application of the results of scientific enquiry to the affairs of man in every range of activity, which has been accompanied by an enormous increase of demand for natural products, both mineral and agricultural. It has coincided with an epoch marked by two world wars, both of which directly affected life and work in these lands, though in different ways.

In the 1914-18 war, what is now Tanganyika was an active enemy theatre of combat, while the adjoining areas to the north-east, since renamed Kenya and Uganda, were mainly engaged in providing such military requirements as their resources could supply for the British forces. The impact of the second conflict was more severe, particularly in its effect upon the native peoples of the whole region. In considering the progress and possibilities of East Africa it is important to keep in mind that effective European influence away from some of the coastal areas is of recent origin. The development of interior communications dates back only half a century, and many early pioneers who have done much to shape the present economic structure are still actively engaged in varied enterprises.

Administration and development

Kenya, Tanganyika and Uganda form a geographical unit with major economic and administrative problems and prospects common to all, each having individual affairs of local importance. Kenya is a Crown colony with a coastal protectorate extending 10 miles inland from the southern boundary to Kipini in the north-east, Tanganyika is a trust territory under British administration, and Uganda a protectorate. For certain administrative purposes the interests of the three are combined under the East Africa High Commission, of which communications and research are important in the present consideration.

The countries are ' new ' from the viewpoint of commodity production, which is remarkably extensive and varied. Agricultural crops range from tropical to temperate climate products, with a diversity made possible by the climatic variations induced by altitude and the great expanses of water in the interior. Livestock industries in the highlands of Kenya supply meat and dairy produce, but the prevalence of several species of the tsetse fly in many parts of all the territories restricts such activities to limited areas and in some places is dangerous to human life. Valuable minerals occur in great variety, many such deposits being worked, while others are under investigation.

The region is in a state of active development, especially in the industrial sphere. New lines of railway communication are under construction and surveys of others have been made. The harnessing of the Nile at Jinja to provide power for the Owen Falls hydro-electric scheme is a major undertaking which will soon make electric energy available for industrial purposes over a wide area. Several organisations are concerned with the investigation, planning, financing and operation of new projects, notably the Colonial Development Corporation with local headquarters in Nairobi, the Uganda Development Corporation and the Kenya Development and Reconstruction Authority. Mining and manufacturing enterprises tend to dominate the outlook and undoubtedly provide attractive possibilities for the continuance and expansion of existing ventures as well as for the establishment of others. The Owen Falls scheme has been planned with the principal object of providing power for industrial use, including the processing of agricultural products. Its influence upon agricultural development is therefore likely to be indirect. It is, however, important to appreciate that many of the industries unrelated to agriculture are, or will be, established in places where soil and climate are unsuited to economic crop production on a large scale.

Factors affecting agriculture

The effects of altitude are displayed in the highlands of Kenya and Tanganyika, where agricultural production is in many cases closely similar to that of higher lati-

Bush country in Tanganyika

tudes. The arid country of much of the interior is only capable of supporting seasonal crops in limited areas and extensive tracts are devoted to game reserves. Irrigation projects are possible in some of the low rainfall districts. Gravity schemes have been established at Arusha Chini and near Taveta, using water obtained from streams and springs fed by the snows of Kilimanjaro. The soils are of volcanic origin and require careful management to avoid the development of saline and ' brak ' conditions. Irrigation is extensively practised by African cultivators on the slopes of Kilimanjaro. Each territory has specialist staff engaged in hydrologic investigations and much valuable information has been obtained, some of which is recorded in reports relating to specific areas.

Typical bush country

Basic data

The high importance of the organised collection and study of meteorological records has been recognised for many years. The East African Meteorological Department deals with this subject for all the territories and, though it is realised that a higher density of observation points is desirable, the extensive data available is of great assistance in assessing the climate of defined areas and their agricultural possibilities.

Soil investigations conducted over a considerable period have enabled data to be accumulated in respect of the more accessible districts, as well as basic information about remoter places. Each territory is concerned with detailed work of this nature related to tracts of land under crops and to areas examined for the purposes of agricultural development. The East African Agriculture and Forestry Research Organisation, with headquarters at Muguga in the Kenya highlands, conducts a wide range of research for the whole region. The agricultural services include provision for crop studies, the nature, incidence and control of pests and diseases and for territorial research, which supplements that carried out on a regional basis.

The special value attached to aerial photographic surveys is a notable feature of the investigational work undertaken throughout East Africa in connection with all forms of development, but it is remarkable that no single organisation is the repository for the photographs and records of their interpretation. The ground survey organisation commenced work and when the territories were first brought under modern administration continued to provide maps, plans and mensuration data required for public and private purposes and to conduct the varied work essential to a sound system of land tenure and control.

These activities by no means exhaust those concerned with the study, use and development of natural resources. A vast mass of information has been collected and is available, though not always in concise and collated forms. Teams of officers have from time to time been appointed to examine and report upon localised projects, each member contributing from his knowledge of a particular subject. Reports compiled in this manner are comprehensive and useful in assessing the probable success of individual schemes. This method has only been employed on a limited scale, but it is undoubtedly a sound approach to such problems.

Apart from the fact that records are diffused through numerous departments, the investigator experiences difficulty in ascertaining where and from whom the varied data needed are available. The accumulated knowledge might with advantage be brought together in respect of each area where soil, climate and other major considerations appear to offer prospects of success for new enterprises. This is already done for specific development projects, but there appears to be no systematic organisation for collating basic data so as to enable specialists or a group of investigators to obtain from one source a presentation of all the particulars needed. Experience shows that in many cases the information is on record, but considerable research is required to collect it.

Preliminary compilations

There would appear to be advantages in a central bureau charged with the duty of obtaining relevant particulars from existing departments and observers in respect of defined areas and of compiling records of them in comprehensive form. This would involve no interference with the normal operation of the departments concerned, but the complete range of available information would be brought together in a co-ordinated manner by a small staff. The more important items and the details in respect of each are:

(1) Location, extent and general description of the area; altitude; population.

(2) Ground survey plans, with contours and topographical details. Aerial survey photographs to a minimum scale of 1 : 30,000.

(3) Meteorological data, including rainfall, temperatures, humidity, wind direction and force, evaporation. Descriptions of climate.

(4) Soil and vegetation; crop production.

(5) Hydrology: nature, quantity and quality of water supplies for industrial and domestic purposes. Main drainage.

(6) Communications: road, rail, water, air, postal and telegraphic.

(7) Land tenure.

(8) Labour supply.

(9) Power and fuel, availability and cost.

(10) Human and animal health considerations.

In addition to these matters, regional and territorial subjects of general application should be concisely described to guide an investigator on questions affecting the broad economy of an enterprise. These would include:

(1) Taxation in relation to industry and agriculture.

(2) Import regulations and customs tariffs, in reference to equipment and supplies.
(3) Labour laws and regulations; wages, services, ration scales. Examples of output of work and cost for typical operations.
(4) Availability and cost of construction materials.
(5) Staff recruitment; immigration regulations.
(6) Internal transportation systems and rates.
(7) Water and Public Health legislation affecting industry and agriculture.

The items listed in these categories do not exhaust the information needed for preliminary investigation, but they do indicate the basic data required to enable an investigator to decide whether further enquiries, including a reconnaissance, are justified to determine the prospects of success of a particular project. Experience on a recent mission of this nature disclosed that a proportion of the points included in the first list and all of those in the second were readily available on reference to the departments of Government concerned.

Reconnaissance

This phase of the mission was absorbingly interesting. Journeys to distant areas where promising conditions appeared to occur were made through all descriptions of settled and productive, wild and barren, extensive and undeveloped country. Vast tracts were traversed blackened by annual firings, apparently devoid of any form of life, canopied by a dull smoky haze, and having the sharp, acrid smell of burnt vegetation. Game reserves extending for thousands of square miles, the famous

A ferry transport on an African river

mountains—Meru, Kilimanjaro, Kenya, Elgon, Ruwenzori—with the fertile lands watered by their streams, and the wonderful lake and river systems of equatorial Africa.

The special object of the investigation limited the reconnaissance to areas favourable to cane sugar developments, but, in addition, broader aspects came under notice. Large expanses of fertile land were visited in each territory; some offered good prospects for the establishment of sugar projects, but all, with one exception, lent themselves to planned and organised agricultural enterprise on a large scale, combined with permanent African settlement. The exception was a badly drained stretch of low-lying infertile sandy soil on the western shore of Lake Victoria. This and other areas just above lake level will be partially or entirely inundated when the Owen Falls barrage is complete.

River barrage for irrigation purposes

Labour supplies and African settlement

The welfare of the African population in relation to development needs the most careful consideration. Existing and new industries cannot survive in the absence of sufficient labour at economic cost. The labour legislation is well designed, but it does not alone appear capable of meeting the long-term requirements necessary to establish permanently family groups, of which a main proportion are gainfully employed. The system of administration of labour laws and regulations encourages employers to allow married workpeople to be accompanied by their families on accepting contracts to work. That, however, does not completely solve the problem of the labourer or the employer. In the long run there are serious risks attached to a break from tribal custom and control by transfer to the conditions of a labour camp, however well regulated they may be. At the same time, the establishment of permanent settlements to provide labour for industry demands careful thought and planning.

The planning of development schemes to include these features is difficult. Agricultural and industrial projects usually need large numbers of workers for their creation and operation and only in rare cases can casual labour from nearby settlements be obtained. It is generally necessary to recruit them from distant districts, on period contracts, and return them to their locations on completion of their agreements. When preliminary investigations have been completed and a decision made to proceed with a new venture it is usually essential to proceed as quickly as conditions permit. The promoters usually cannot afford to wait for the build-up of a labour force from co-existent schemes for African settlement and the relocation of considerable numbers of Africans on an enduring basis must be rather slow. A suitable proportion of male labourers might be accompanied by their families and the first selection for transfer to a permanent settlement made on this basis, and as the enterprise progresses requests from the men to have their families with them could be dealt with at a rate depending on the advance of the main project and on that of the settlement. The success of such a system would be influenced by the co-operation between the Government and the operators of the scheme, the nature and extent of the financial and other active support available and the general conditions of the enterprise. The overall design should provide for the development scheme to reach profitable production as quickly as economically

possible, and for the associated settlement to proceed in orderly fashion with the minimum of interference.

Integrated development

The development of tracts of land for agricultural ventures and for ranching should involve effective control of land use by the grantees or lessees, whether they be large companies or small farmers. In some cases the raw products would be processed at a central establishment. The areas available for integrated development might embrace several large projects for main crops in combination with schemes for African settlement. The mode of operation of each would require the economical use of manual labour and the maximum extent of mechanisation, without which the association of industry with settlement would prove costly, if indeed it could succeed at all.

A roadside scene and growing sugar cane

Supervision of labour

A general complaint throughout East Africa is that labour supplies are inadequate and difficult to obtain, but it was apparent that the manpower available was not being effectively employed. The principal reason for this is inadequate and inefficient supervision, resulting in wasted and misapplied effort by the labour. The pressure of supply and demand may perhaps lead to the remedy, but in the meantime many promising ventures will suffer unless the importance of using labour for manual work of all kinds efficiently is recognised. It is not a case of greater exertion by the same number, but of higher productivity for the same expenditure of energy. The application of industrial efficiency methods and studies to manual agricultural operations in British Central Africa would lead to great improvement with advantage to labour and the employers.

Conclusion

There are outstanding opportunities for new zonal developments for the production and processing of annual and permanent crops and for the expansion of existing enterprises in East Africa. It is apparent that comprehensive schemes for promising areas should be prepared before any of the lands concerned are released, their development being envisaged from the outset in such a manner as to prevent fragmentation and the establishment of unsuitable enterprises to the detriment of major projects. The aim should be an integrated economy suited to the district, including successful large-scale production of agricultural commodities for which steady markets exist and the establishment of a contented and industrious African population to provide a reservoir of skilled and unskilled labour.

Tobacco in Italy

Tobacco cultivation in Italy first began in the 16th century, but the main development of this activity has taken place during the last 60 years. The Italian demands have lately been mainly satisfied by purchasing abroad, but economic motives have induced the acclimatisation in Italy of the exotic varieties.

Efforts have been mainly directed, however, to the search for Italian varieties obtainable by cross-breeding and types of tobacco suited to Italy were obtained, firstly, by a process of acclimatisation and secondly, by selection and separation of individuals endowed with suitable characteristics. Italian experts have now obtained a number of new types. The climate in Italy permits the production of Oriental, American and sub-tropical tobaccos.

Varieties of *Nicotiana rustica* are cultivated near Palermo, the so-called *Nostrano* variety in the Brenta valley and Veneto, the *Beneventano* near Benevento and Avellino, and the *Secco di Sardegna* near Sassari. As to the exotic varieties, Kentucky tobacco is cultivated in Lombardia, Veneto, Emilia, Toscana, Umbria, Marche, Lazio and Campania and finds employment for the 'Toscano,' a classical cigar, and for minor utilisations.

The tobaccos of Oriental type (*Erzegovina*, *Xanti*, *Perustitza*) are employed in the manufacture of cigarettes and their cultivation takes place in Lecce, Chieti, Pescara and Lazio. Maryland tobacco is cultivated in Salerno and Caserta, Burley tobacco in Campania, Piemonte and Lazio, Bright Italy tobacco in Umbria and Friuli. These last tobaccos are principally utilised in the cigarettes of American type. Subtropical tobaccos for the fabrication of dark cigarettes and cigars are cultivated in Veneto.

The total area under this cultivation in Italy amounted to 34,000 hectares in 1930, as against 1,636 hectares in 1889. The second world war caused a considerable reduction of the output and a remarkable qualitative degeneration. A big reconstructive effort has increased, however, the tobacco-growing area to about 60,000 hectares, mainly in Puglia, Veneto, Campania and Umbria, and the total output from 37 million kg. in 1938 to 79 million kg. today.

In the agricultural phase of production more than 150,000 workers are employed. Italian raw tobaccos are sold on the principal European markets and in America, Asia and Africa.

Domestic consumption of the finished products amounted in 1951-52 to 38,867,000 kg. of a total value of 293,953 million lire, while exportation absorbed 736 million kg. with a value of more than 1 milliard of lire; cigarettes constitute 78% of the finished product.

The Reclamation of Land Flooded by Sea Water

PROF. G. DELOFFRE
Faculte des Sciences, Lille

The late Prof. Deloffre carried out extensive studies of the soils in the Dunkerque area which was inundated with sea water by the Germans in 1944. The main results of his observations are summarised in the following paper which was written especially for WORLD CROPS *shortly before his lamented death in July 1953.*

IN 1944, some 40,000 acres of land in the Dunkerque area in Northern France were flooded with sea water by the Germans. During the years that followed the behaviour of these soils was observed. The main events observed were (*a*) a period of slow leaching out of the chlorides by rainfall, followed by (*b*) a period of deterioration of soil structure.

Leaching of chlorides

Analysis of samples of soil taken periodically after the flood waters had been removed at particular points showed as follows:

(1) Immediately after the removal of flood water the top layer of soil has a very high salt content, much higher than that of the deeper layers. After rain has fallen on these soils the leaching of salt from the top layers is very rapid.

(2) On lower lying, badly drained lands, where rain water flowing from higher levels accumulates, it was observed, on the other hand, that a very small decrease or even an increase of salt in the top layers takes place.

(3) Leaching of salt from the lower layers in such lands is much slower than in the surface layers.

In regard to the salt content of water in drains, canals and ditches (normally used for cattle), it was found that after a single winter period the quality was fairly satisfactory. On this basis it was possible to forecast that crops would suffer relatively little from the toxic action of the salt and that, in consequence, it would be possible to restore lands to cultivation fairly easily.

It was found, in fact, that land that had been cleared of sea water in September 1944 had by the springs of 1945 and 1946 sufficiently recovered to enable the cultivation not only of crops tolerant of salt, but also of many other crops as well. Moreover, the drainage network of canals and ditches which had been silted up with mud during the flooding could be put back into working order and kept in good repair so that rapid draining and leaching of the soil could be assured.

Decline of soil structure

The clay of the normal soil of this region is a calcium clay and this had been changed into sodium clay as a result of the inundation. After a certain amount of chlorides had been leached out, deterioration of soil structure, owing to the dispersion of sodium clay, appeared and developed progressively. As this is important, it is desirable to describe and discuss briefly the causes of this deterioration, its consequences and the means of avoiding or remedying it.

Visual symptoms of soil deterioration

The symptoms are particularly striking in soils that had been partly flooded and, in general, a marked contrast can be seen between the soils in the flooded and unflooded zones from the point of view of permeability, colour, consistency of clods, hardness of the dried soil and tendency to swell and contract. Figs. 1 and 2 illustrate the contrast between areas which have been submerged and those which have not. Fig. 2 shows a field which was not submerged, but was contaminated by sea water which penetrated through the ground by means of tile drains; subsequently a deterioration in the soil structure occurred over the whole area of the drainage network, which became obvious on the surface of the soil during the rainy season. Little puddles of muddy water formed in the hollows between the clods, which persisted for a long time, while the removal of the excess water from the soil by drainage was very slow. The clods did not hold together, but collapsed, giving rise to a very curious and characteristic appearance in the surface of the soil (see Fig. 3), and a superficial glazing of the soil was also observed.

In dry weather, the soils became white; the top layer of the clods dried rapidly and formed hard clods, while the interior of the clods remained very damp and pasty. Later the entire clod hardened and it became impossible to break them with the hand. This hardening of clods was particularly noticeable when one walked on the soil in the field. It reminded one of walking on rocks without elasticity. Moreover, soil cracking in dry weather was much more marked and occurred earlier in areas that had been flooded than on lands that had not.

Fig. 1.—The white zone indicates land which was flooded, the black zone land which was not and in the centre is a damper patch

The causes of structure deteriorating

From a chemical point of view the following changes were recorded in the amounts of exchangeable bases fixed by the clay-humus complex:

A marked increase of the exchangeable nitrogen (10 to 25 times greater).

A marked increase of exchangeable magnesium (3 to 5 times greater).

A marked increase of the exchangeable potassium (1.5 to 3 times greater).

A marked decrease of the exchangeable calcium (3 to 6 times less).

The physical effects on the soil appeared to be increases in the power of water retention, of plasticity, of resistance to crushing, of sensibility to dispersion, and of the size of the clods formed, while there was a decrease of the porosity and permeability and in the amount of water held by the soil.

The visual symptoms referred to above are the results of dispersion and increased power of expansion of the sodium clay. During rain it was noticed that micro-erosion was visible on the surface of the ground, together with scouring of sandy particles in the hollows of the clods. Glazing following scouring is another characteristic and this may also be an index of the degree of dispersion (Fig. 4).

In summer, after heavy rain, there is a considerable removal of clay particles which makes turbid the water issuing from tile drains and a smaller movement of scoured sand particles which form little beds of sand in the cracks; this in itself is a good index of the decline of structure.

Imperviousness may be the result of the increased power of expansion of the clay and of the blocking of cracks and pores by dispersed particles. It was observed that during the rainy season a characteristic green and blue coloration appeared on the top layers at depths of ½ to 1 in.

The surface white colour appears to be due to scouring of sand particles, ending in rapid drying out of the top layer.

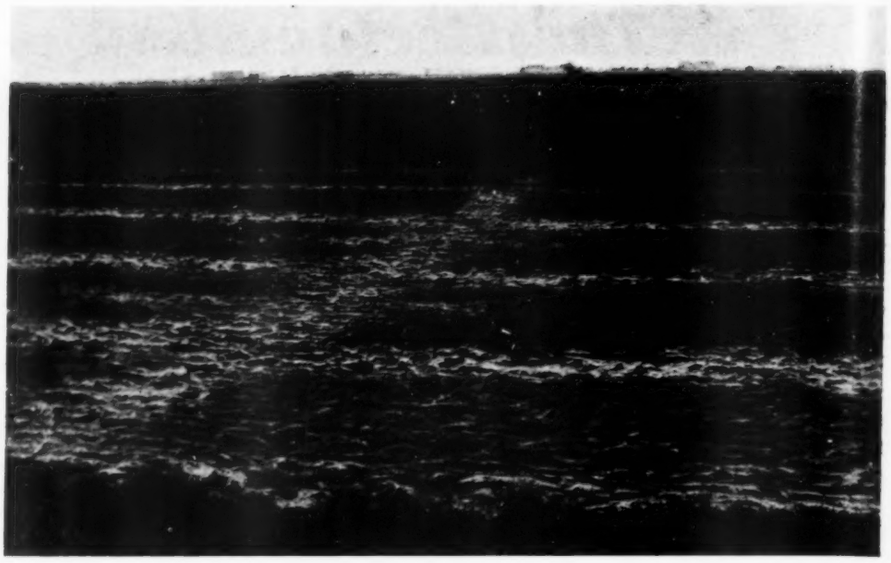


Fig. 2.—This field was not submerged, but was contaminated with sea water

Development of structural deterioration

The symptoms described above do not appear until after the flood water has been removed and only begin to manifest themselves after a certain period of delay. At first they are hardly perceptible, but later become more marked; they affect the lower layers as the leaching of chlorides progresses. Very often this is accompanied by a decrease of the acidity of the soil by about 0.8 to 1.0 pH. This period of delay corresponds to the time taken to reach the critical concentration of salt at which dispersion begins to be perceptible.

It is difficult to define limits for this critical concentration of salt. In our work we have recorded cases in which surface soils showed a concentration of 2 to 3 g. of chlorides per 1,000 g. of dry soil and yet exhibited no marked degree of dispersion, while we have also encountered soils which with chloride concentrations of no more than 1 to 1.5 g. per 2,000 g. of dry soil showed marked dispersion. In the laboratory, the critical concentration appears to be usually from 3 to 5 g. per 1,000 g. of dry soil.

It seems reasonable to suggest that it is necessary to study the rate of leaching of chlorides from a soil in order to forecast the occurrence of undesirable phenomena and enable steps to be taken to avoid them.

In the Dunkerque area, decline of structure began to appear during the winter immediately following the removal of the flood water, but it became much more developed during the second and third winters.

In the Verdon area in November 1948, three years after the flood water had been removed, it only began to appear at some points where leaching had been intense.

Fig. 3.—This surface condition followed deterioration of the soil structure

Variations in the intensity of structural deterioration

Very wide variations were observed in the intensity of structural deterioration. In one soil, for example, structural decline was more noticeable when rainfall was abundant, and when the soil was worked frequently to considerable depths and the

surface soil left bare instead of being covered with vegetation.

Structural decline is more noticeable when the salt content of the flood water is high, the clay content of the soil high, the humus content low, and the alternation between submersion and emergence during flooding frequent. It is difficult to evaluate exactly the role of each of these factors, but frequent and deep tillage on damp soils have given quite disastrous results in the long run (Fig. 5).

The effects of structural deterioration

In the drainage network it was usually found that immediately after flooding canals and open ditches became silted up with black mud; tile drains were not usually silted during the period of flooding, but after the mud had been cleared from the canals and open ditches and structural deterioration had begun to develop, rapid silting up of open ditches by white mud (colloidal clay) and more or less complete silting up of tile drains usually followed, unless heavy dressings of gypsum were applied.

The effect on tillage operations

It is very difficult to determine the best period for tillage operations. If the farmer waits till the top layer is dry enough to bear horses and tractors before commencing tillage, he usually finds that it is extremely difficult to plough the soil up, while once the hard surface layer has been broken the plough tends to sink in the underlying plastic layer and to become bogged. On the other hand, if tillage is attempted when the top layer is damp horses and tractors sink into the soil and large clods are produced which harden in dry weather and collapse in rainy weather, but do not readily crumble.

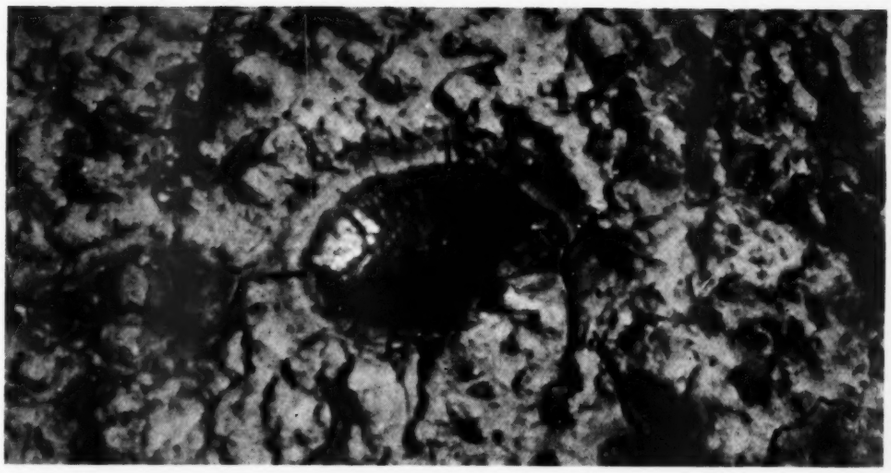


Fig. 4.—Glazing following scouring of sandy particles in the hollows of clods

If there are high and low areas in fields, it is often impossible to achieve an even state of tillage, the higher areas drying out more quickly than the lower ones. If such land is not sown immediately after it has been tilled, it may be necessary to till it again before sowing if there is any chance of rain, while, in any case, it is practically impossible to secure a fine tilth on soils containing numerous clods. It is also often impossible to secure satisfactory work from weed and fertiliser drills and often sowing and fertilising have to be done by hand.

It has been found that deterioration of soil structure is reduced to the minimum when tillage is performed to the least possible extent and confined to discing the surface layer before sowing. Deep ploughing of damp soils has had quite disastrous results. This seems to disagree with experiences elsewhere, where deep ploughing is reported to have had good results, but this discrepancy is confined to soils where the content of salt is above the critical dispersion point for sodium clay; deep tilling speeds up leaching of salt from the top layers and hinders the rising of salt from the deep layers, but does not help to remove dispersion.

In the Dunkerque area, the salt content of the soil water was often inferior to the critical concentration and in these conditions tillage helped dispersion.

Effects on the growth of crops

During wet spells the top layers of salted soils usually become sticky and impervious and interfere with penetration of air, which causes crops to suffer. During dry spells, on the other hand, the surface layer of clods dries out rapidly and forms a hard crust, while the interior of the clods remains damp for a long time. In these circumstances the water in the clods is unavailable to roots of crops which cannot penetrate the hard crust. The power of retention of sodium clay for water is greater than that of calcium clay and the result is that for the same water content the percentage of water available for vegetation growth is less in sodium clays than in calcium clays. On such soils, plants lack air and water and also suffer owing to the hardness of the clods.

Since 1946 onwards it was noticed that on soils of poor structure the germination of seeds was delayed and irregular because seed lodged between large clods and did not always find enough water to germinate; in a field of sugar beet sown on May 9, 1948, there was regular germination on all parts of the field which had a satisfactory structure and tilth, successive germinations

Fig. 5.—The result of deep and frequent tillage

taking place on May 26, June 9, June 23 and July 7, each corresponding to a fall of rain. In the rest of the field where structure was poor the development of the root system was much slower and very irregular, as the roots of plants had to go round hard clods or follow cracks in the field. Fig. 6 illustrates the difference in the root system of beets grown on the two parts of this field.

Under such conditions growth was similarly slow during the early stages of maize plants (see Fig. 7). The root system is always much less developed in soils with bad structure and the subterranean parts of the young stems are usually distorted. Comparative measurements made during growth of wheat, barley and oats showed that the growth rate of stems is always slower in soils with bad structure, while tillering is always two or three weeks later and is less abundant.

Spring crops are generally much worse affected than winter crops. In autumn, germination is delayed by excess of water, but the plants give good protection to the soil against the mechanical action of heavy rain and the drying effect of the wind in spring. In spring, however, owing to the late drying of the soil, tillage and sowing have to be done very late and farmers were often compelled to abandon crops which required early spring sowing.

Regeneration measures to improve soil structures

To avoid decline of structure and its disastrous consequences it is necessary to reduce, as far as possible, the mechanical working of soils and dispersion by readjusting the composition of the clay complex by dressings of soluble calcium salts. In experimental fields it was observed that equimolecular dressings of calcium sulphate had a very effective action, although it was slower during the first two years, unless sulphur was applied in early spring. The effect of dressings of calcium chloride, on the other hand, was hardly perceptible.

Field experiments enabled determination to be made of the best time and conditions for applying calcium sulphate, and it was found that it should be evenly spread on the land as soon as possible after the flood water had been removed, and when the soils had dried, at the end of summer or early in autumn.

The low solubility of calcium sulphate allows it to remain as a reserve on the surface during five to seven months and to dissolve progressively with each fall of rain. The effect is to avoid dispersion owing to the mechanical action of heavy rain and to allow the calcium sulphate solution to penetrate deeper and deeper into the soil. As a result, the regenerated top layer rapidly forms a cover which protects the underlying layers not yet regenerated against quick alterations of wetting and drying.

Fig. 6.—The difference in the root system of beets grown in two parts of the field

It is easy to understand the necessity for not upseting this progressive regeneration by winter tillage. In spring, the depth of tillage must not exceed the depth of the regenerated layer and it is better to till with implements which do not invert the top layer.

Effects of farmyard manure

In the course of our work efforts were also made to improve the structure of the soil by heavy dressings of farmyard manure, but no noticeable improvement was recorded. The attempt was also made to ascertain whether sowing alfalfa would improve the structure. It was noticed that alfalfa and, even better, grass helped to arrest the early decline of structure in as much as they covered the topsoil during the rainy season and compelled farmers not to work it. If grass or alfalfa is turned under in autumn decline of structure appears and develops during the following winter on the bare topsoil unless dressings of calcium sulphate are applied either before sowing or during vegetation or just after turning up. The growth of grass and alfalfa was better when calcium sulphate had been applied before sowing.

Duration of the improvement of soil from calcium sulphate

In the absence of dressings of calcium sulphate the consequences of deterioration of the soil from salting may last for 30 years. In Holland, it was observed near Berg, off Zoom, that in a polder which had been accidentally flooded with salt water in 1906, and of which a part had been deeply ploughed while it was still damp, by 1947 the soil structure was still very bad and the harvest less satisfactory than in other parts of the area; with dressings of calcium sulphate and working of the soil surface the ill effect disappeared in the next four to six years.

Continued on page 493

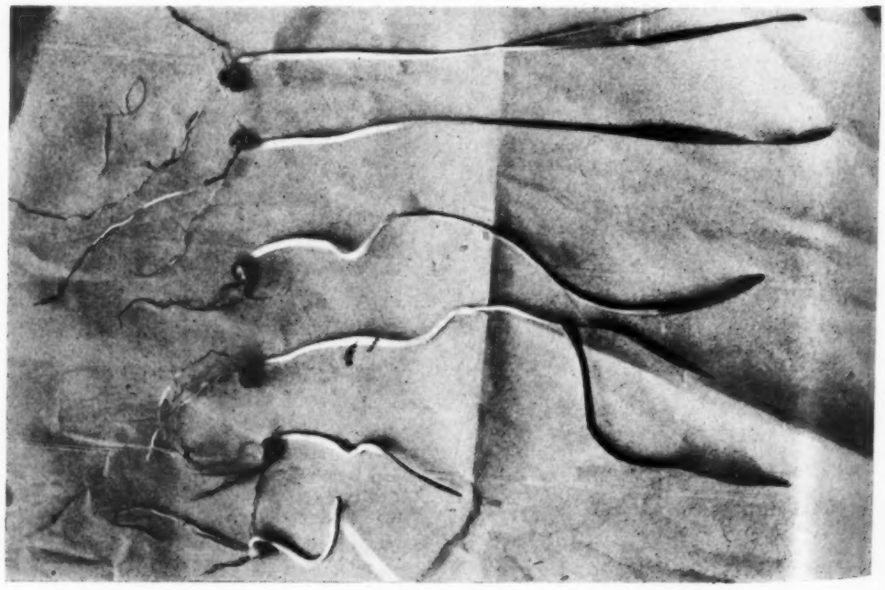


Fig. 7—Slow growth during the early stages of maize plant

The Port of London

All agricultural countries which export a large proportion of their products, and all countries which depend on imports for a proportion of the food and raw materials they need, rely in large measure on the facilities at the ports to enable trade to go on. It is not too much to say that the facilities at ports condition very largely the possibilities of trade developments. Consequently, the following summarised account of some of the activities of the Port of London will prove of interest to our readers. It has been compiled from data placed at our disposal by the Port of London Authority.

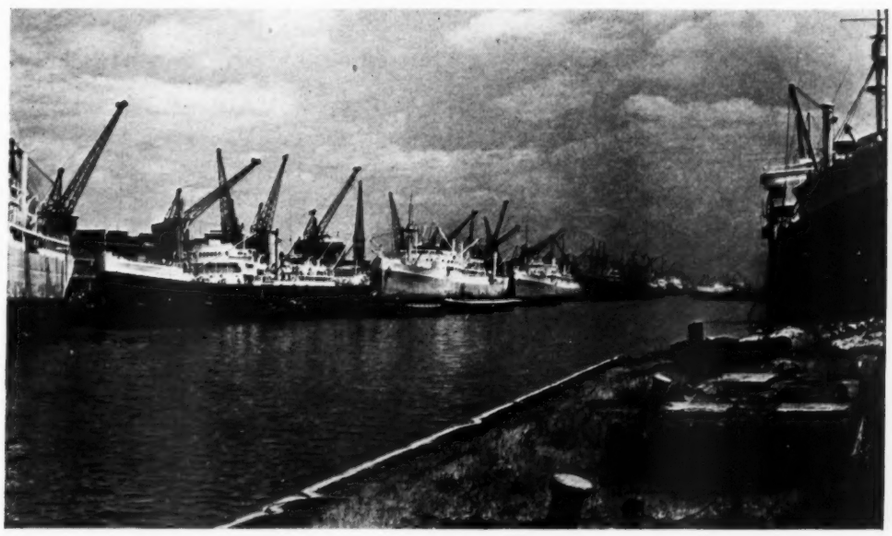
LONDON was a port before it became a great city and the capital of England. While, on the one hand, London as the capital is founded on London as a port, the development of London as a port has been stimulated by the commercial, financial and political growth of the capital city. The River Thames was, of course, the predominating factor; without the river there is no reason to suppose that a city would have existed.

PLA sphere of activities

The present-day Port of London comprises the tidal Thames from Teddington to the estuary and five large dock systems vested in the Port of London Authority, besides several hundreds of privately owned riverside wharves and a number of privately owned docks. The Port of London Authority is thus responsible for the control of 69 miles of one of the busiest waterways in the world and the maintenance and operation of a dock estate with an aggregate area of 4,183 acres, of which 712 are water area, with nearly 37 miles of deep-water quayage for berthing ocean-going vessels.

Dock operations

A ship is a profit-earning machine only while it is engaged in transporting cargo and every hour spent in port is a loss to the shipowner. Similarly, the earning power of docks is determined by the number of vessels accommodated and 'worked' in them. The Authority's organisation at the docks is accordingly designed to give the maximum of expedition in the discharge and loading of vessels. Although the big difference between high and low water in the Thames has necessitated the installation of impounding pumping stations at all the docks, the construction of new locks and the modernisation of the older ones enables ships to reach their berths with little delay. In selecting a berth for a ship, dimensions and draft are obvious factors to be considered. But almost equal consideration must be given to the type of cargo to be discharged and/or loaded. For example, a berth alongside a granary for a grain ship and one adjacent to a cold store for a meat freighter is obviously the most economical and expeditious arrangement for these classes of vessels. At most of the docks a system is in vogue where 'appropriated berths' are allocated under certain conditions to the use of shipowners operating regular services to and from the port.



General view of shipping in the Royal Albert Dock

Under this arrangement a shipowner rents an agreed length of quay and enjoys the use of the adjacent quay sheds.

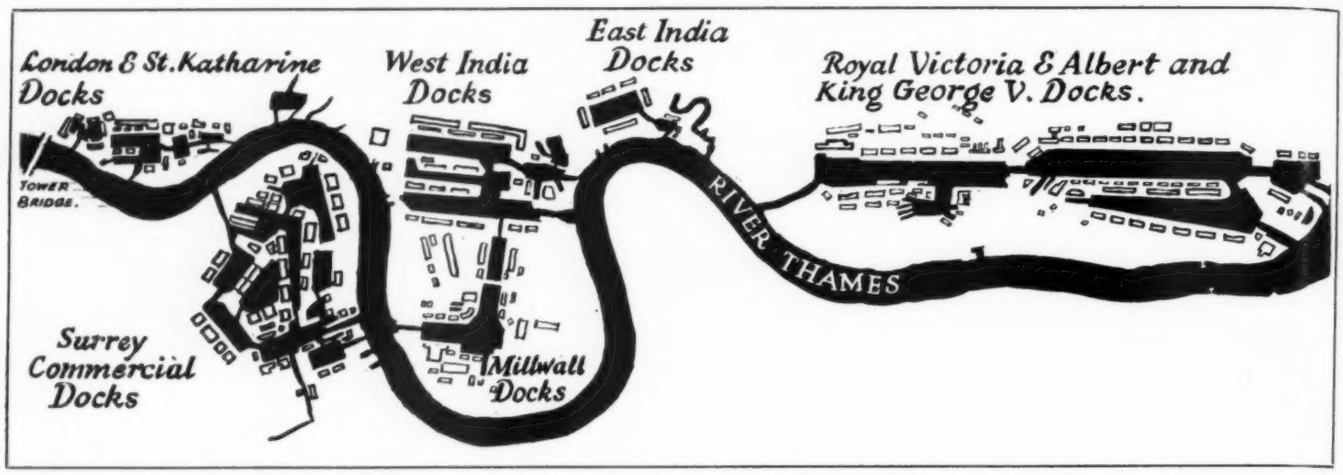
A very large volume of the goods imported in ships discharged at the docks is distributed by means of lighters. Lighterage and towage services in the port, except internal dock requirements, are provided by private enterprise and the industry employs about 7,000 lighters and 250 tugs.

Imports, exports and transhipment trade in normal times represent nearly 50 million tons of merchandise per annum flowing through the Port of London. While a large proportion of the goods imported represents the requirements in food and industrial raw materials for the population of some 9 million people living in the immediate hinterland of the port, London is an important distributing and exporting centre for the United Kingdom generally. The Port of London has acquired, therefore, a degree of national importance greater than any other British port.

Importations of agricultural produce

Imports through the Port of London include almost every conceivable type of produce from almost all parts of the world.

The discharge of an ocean-going ship may be a complex operation requiring considerable advance planning. In certain docks of London discharge is undertaken wholly by the Port Authority. Before the work can begin, the Authority require to know the ship's dimensions and draft for the purpose of selecting a berth and the type and disposition of her cargo, its probable outlets and what quay facilities are needed. The next factor is to know the manning required and, since a quick turn around is essential, the maximum number of gangs which can work efficiently under the conditions on the ship. Speedy working depends, not only on the number and size of gangs, but also on their quality, and also certainly on the construction of the



Sketch map of the London Docks (excluding Tilbury)

ship, the type and condition of the cargo and the derricks and cranes available.

Types of cargo

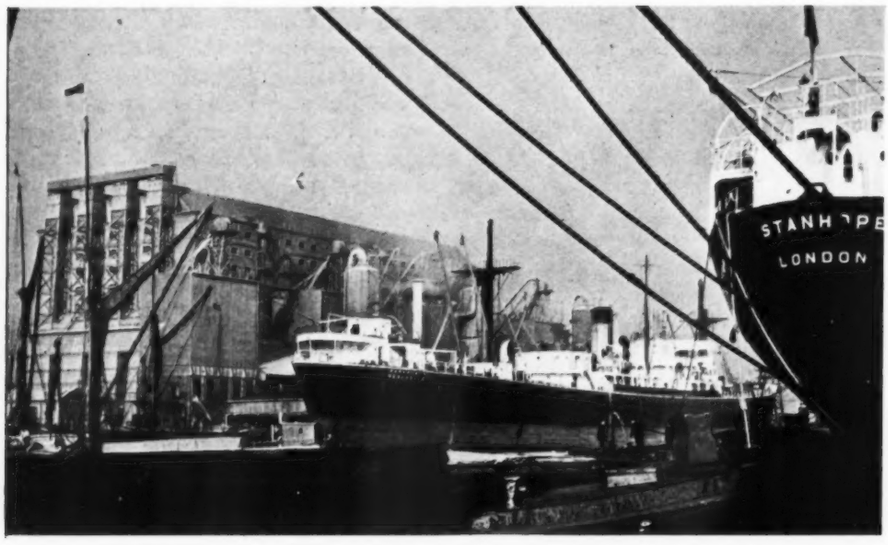
Below are given brief descriptions of some of the more important import cargoes of agricultural significance and the arrangements made for handling them.

Grain

The general term ' grain ' may be taken to include wheat, barley, oats, maize and pulse. Annual figures show that London is the principal port of Great Britain for the import of grain. The total quantity of the various descriptions brought into London by ships during the year ended March 31, 1950, was 1,482,877 tons; this included 1,103,347 tons of wheat, 14,715 tons of maize, 120,222 tons of barley and 18,260 tons of oats.

Grain reaches London in cargo liners and tramp ships and is shipped either in bulk or in bags. The principal berths used by vessels with full grain cargoes are situated in the Millwall Dock alongside the Central Granary operated by the Authority, and a privately owned flour mill, and alongside the flour mills at the Royal Victoria Dock. These berths are all equipped with fixed pneumatic discharging plant, but ships can be berthed at many other quay or buoy berths and discharged by the Authority's floating grain elevators. In the main, however, the grain business is confined to the Royal Docks, the Millwall Docks and Surrey Commercial Docks.

By far the major portion of grain imported into London is carried in bulk. This method of shipment has tended to increase of late years, for thus the loading and discharging can be carried out more expeditiously than when the cargo is in bags. It does happen occasionally that shipments arrive partly in bags and partly in bulk.



Ship discharging at the Central Granary, Millwall Dock

Grain machines of the pneumatic elevator type are used and most of the grain that reaches London is handled through them. The use of floating elevator plant is particularly convenient and economical for vessels with part cargoes of grain, as the work of discharging general cargo from other holds can proceed simultaneously with the discharge of grain. In the old days cargoes were discharged by hand gangs using the bushel measure and sacks. Later bucket elevators were introduced and were extensively used until the more speedy pneumatic elevators made their appearance.

The Authority has seven floating pneumatic grain elevators. The method of discharge by pneumatic elevator is by means of the branch suction pipes which trail in the holds of ships from pipe booms and through which the grain is sucked and transferred to chutes on either side of the elevator discharging into craft. These machines also incorporate equipment by means of which the cargo can be automatically weighed during discharge. At the Royal Docks grain in bulk is discharged into the Authority's barges and then towed to the quayside silos at Royal Victoria Dock, where it can be stored pending delivery to railway trucks or road vans in bag or in bulk.

The Authority's Central Granary, Millwall Dock, is a large 11-story building and a conspicuous landmark for miles around. Ships berth alongside the granary, where the equipment comprises four ' towers,' and the large 10-in. pipes, two from each tower, trail from almost mast height into the holds of the ship. In this great granary the Authority provides a power-driven screening and/or separating machine which is capable of grading barley or extracting half corn, dust, straw, cockle and extraneous matter from grain. This machine, which is also capable, within certain limits, of separating mixtures of

grain, is frequently used in instances where, through stress of weather at sea or other causes, a mixture of grain has resulted. It is also very largely used to clean and separate dust, straws, etc., from malting barley before delivery to the maltsters. This machine has a varying output according to the nature of the grain being handled, but its general operational performance is from 15 to 25 quarters per hour. Also situated at the Millwall Docks is the famous and well-equipped flour mill of McDougall's Ltd.

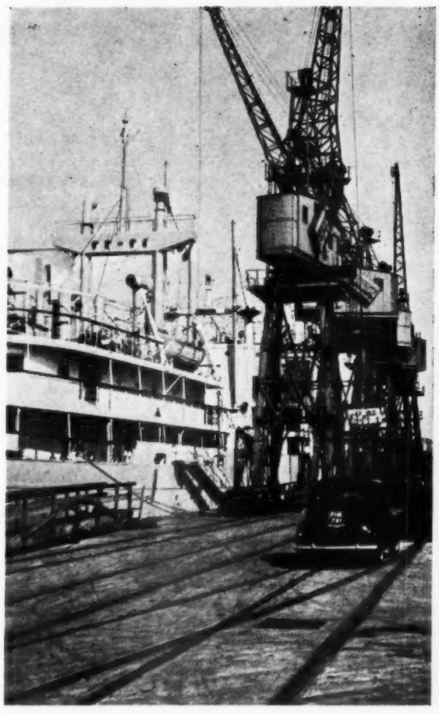
The Royal Victoria Dock has become the most important grain centre in the Port of London, especially since its complete modernisation. On the south side of the dock there is a chain of large waterside flour mills each with its own quayside plant which enables grain to be delivered direct from the holds of ships into the mills. These flour mills are owned and operated by the Associated London Flour Millers, Spillers Ltd. and the Co-operative Wholesale Society respectively.

Coffee

Among the almost countless items of cargo handled by the P.L.A., coffee is one which has always claimed the service of experts both in its warehousing and the many operations which are performed on behalf of importers and merchants. The coffee trade of the Port of London has, since the war, been concerned mainly with shipments from the Brazilian ports of Santos and Paranagua (the Rio de Janeiro coffee not being suited to English palates), the Belgian Congo and the East African countries of Kenya, Uganda and Tanganyika.

Before 1939, a certain amount of coffee was still being imported in its outer husk and one of the operations performed by the P.L.A. on behalf of traders was that of dehusking. Some Brazilian coffee was husked before shipment and washed to improve the colour (the greener the coffee the better the price) and to add polish to the beans. Arabian and Abyssinian coffee arrived in straw bales known as half frazils weighing about 1½ cwt. each; they were bulky packages, awkward to handle and difficult to pile, but they had the merit of containing a coffee consistent in quality which did not need bulking. Whether the beans arrived in husks or otherwise, taring was always performed to arrive at the net weight; each parcel was split up and piled in multiples of 20 bags, each group being brush-marked with a lot number. The importer was then supplied with a landing account, weight note and warrant.

Until the outbreak of the second world war, the Authority's coffee storage was centred at London Dock, in No. 10 Ware-



Quay scene, West India Docks, showing modern quay cranes

house, but, from 1922 for a few years, extra accommodation was used at the East India and West India Docks to cope with the large Brazilian imports received as the result of a British loan to that country. During this period three cargoes, each of over 100,000 bags, arrived in addition to numerous smaller shipments.

The last war engendered many changes in the coffee trade, and in September 1940 No. 10 Warehouse was completely demolished by enemy action. After the destruction of No. 10 Warehouse, fresh accommodation for coffee cargoes was provided at the newly constructed brick and concrete No. 1 Warehouse at Surrey Commercial Docks. In 1944, this trade was transferred to 'M' Warehouse, Millwall Dock, an even newer structure which had been rebuilt after damage by high-explosive bombs. This modern warehouse provided ideal conditions for coffee storage.

Each country of origin has its own method of grading. The Brazilian shipments are mainly 'extra prime quality' with small quantities only of a slightly inferior grade known as 'Type 6/7,' the Santos shipments fetching a premium over like grades from Paranagua. Kenya coffee is classed as A, B or C (large, medium or small). Two types are imported from Uganda and Tanganyika, *Arabica*, a flattish variety, and *Robusta*, a rounder type.

On receipt of a shipment, taring is carried out by experienced P.L.A. warehouse staff on an agreed proportion of the total. The tare varies considerably according to the country of origin: sisal bags from Africa show a tare of 2/3 lb., but those from Santos, made from a fine hessian, show only about 1 lb. All bags are check-weighed to within 1% of their stated weight, all light bags being made up to the present standard weight of 132 lb. net. 'Loose-collected' coffee is carefully cleaned by sieving and then bulked to ensure a uniform grade. When finally brought to account, a consignment is stowed in piles, each pile bearing an identification mark; samples are also taken for sale purposes. Landing accounts supplied to importers contain a recapitulation showing the number of empty bags in hand as the result of making up all bags to a standard weight and the amount of any remnants left over.

At the present time, the coffee importing trade is in a state of transition from Government buying to the pre-war system of private trading. The Ministry of Food is taking only 50% of the amount bought in 1952, leaving the balance to be obtained, under licence, by firms who were operating in this trade when the Ministry of Food assumed control in 1941. It might be assumed, as Ministry buying accounts for only 50% of 1952 imports, that private trading would also be responsible for a similar amount. Such, however, is not the case; tea, now derationed, has reclaimed many adherents and the present high cost of coffee (and milk) has already affected its sale.

The first public sale after a lapse of 11 years was held on January 9 at Plantation House, Mincing Lane; the London Commercial Sale Rooms, the pre-war home of coffee sales, having been destroyed by enemy action in 1941. The quantities offered were small.

Tea

The East India Co. was mainly responsible for the first direct importations of tea, and from that time to the present day tea has ranked as one of the principal imports handled in the Port of London. The company held the monopoly of tea transport to England until 1833, after which the famous tea clippers appeared, leading to the famous tea races across the ocean, culminating in the epic of the *Taeping* and the *Ariel* in 1866. In earlier years the tea trade was mainly brought to the East India Dock, but as larger docks down river were built tea ships' berths became more dispersed. Today, ships carrying tea are discharged at Tilbury or the Royal Docks, generally speaking. The late war altered many of the age-old practices in regard to the storage of tea. Formerly, tea was stored in the Commercial

Road depot until merchants took delivery; today, it is stored in the Cutler Street warehouse and at London Docks.

The P.L.A. employs an expert staff to supervise the many operations required by the trade. These include receiving, housing and ' bedding ' the package, no mean operations, since anything up to 1,300 packages may be received at one point in a day. These must be checked in, taken to the prepared floor of the warehouse, where they are sorted and piled in the prearranged areas or ' beds.' Then the chests are weighed gross and sampled. Once samples have been taken the sampling holes are sealed with caps or bungs. To ascertain the net weight per package a certain number of chests in each ' bed ' are selected for taring. This is done by tipping the tea from the chest into a bag and weighing the empty container. One-pound samples are then drawn from one package per ' bed ' and forwarded to the broker or importer for selling purposes.

Traders make inspections of their consignments and, if there is much variation in the contents of the chests in a ' bed,' a bulking order is issued. Bulking, which must not be confused with blending, is a large-scale operation carried out by the authority's staff. A large canvas sheet of an approved quality is spread over the floor of the warehouse and the contents of each chest in the consignment are tipped out into small heaps near the edge of the sheet. Then men with wooden shovels systematically turn the tea over and over towards the centre and by the time one huge mound has been formed a uniform quality of tea is assured and the chests are then refilled.

Sugar

Imported sugar is in two categories—refined or ' direct consumption ' sugar, and unrefined or raw sugar—and the dock operations vary according to the category. So far as the Port of London is concerned, annual imports, refined and unrefined, reach 1,163,000 tons and exports of refined sugar 489,000 tons. In the case of the former, the sacks are weighed singly in a warehouse and brush-marked with the weight and the dock number before being piled. Each of the piles is labelled with other relevant details, such as the ship's name, rotation number, port of origin, etc. Unrefined sugar is weighed in drafts—that is, sets of five sacks or more — before piling.

Since the beginning of the 19th century the fine range of warehouses at West India Docks has housed the bulk of London's sugar imports and, in spite of the ravages of war, merchants often request their particular consignments to be sent to the West India Docks. In the old days ships were berthed alongside the quays nearest the warehouses and the sugar landed and hand-trucked to the sheds and warehouses. Today, owing to the widely dispersed storage centres necessitated by war damage, ships are berthed where convenient and if within reasonable distance of the warehouse or open-storage site the sugar is conveyed thereto by a shuttle service of trucks or trailers towed by Fordson tractors. Where the distance precludes this method, or where ships discharge at a buoy berth, either in dock or in the river, the sugar is delivered overside into craft and the same method employed to convey the sugar ex craft to store.

Bulk sugar being discharged at the West India Dock

Sampling is an important and considerable task performed by the Authority. Individual samples are taken from bags by long ' triers ' or sampling irons. The individual samples are bulked and made up into a 10-lb. dock sample and sent to the Customs authorities for the polariscopic test, on which the duty payable is determined.

Housing sugar presented a problem after the war owing to the loss of warehouses by enemy action. ' Direct consumption ' sugar is always placed in the warehouses, but unrefined sugar is sometimes piled, with suitable precautions, in the open under tarpaulins, the piles being built in haystack fashion. This method, which was adopted with some reluctance by both the Authority and H.M. Customs, has, in fact, proved to be satisfactory.

The carriage of sugar in bulk, a post-war development, is becoming increasingly important, and the P.L.A. has introduced special equipment to meet its needs.

Tobacco

The Port of London has always been an important point of entry for imported tobacco. The heavy duty carried by tobacco necessitates that all tobacco passing through the Port of London should be accompanied by especial precautions: barges, trucks and vans carrying tobacco in bond are locked and sealed by H.M. Customs or are accompanied by a Customs watcher. The doors of warehouses in which tobacco is stored are locked by the Customs and the P.L.A. Broken fragments of leaf and tobacco dust are collected daily and destroyed under supervision by H.M. Customs in the destructor known traditionally as ' the Queen's pipe.' Finally, no tobacco, duty paid or otherwise, leaves the dock premises without the sanction of the Customs authorities.

Unmanufactured tobacco usually arrives at the Tilbury, Royal, West India or the Surrey Commercial Docks as part of the general cargo in ships from North and South America, India, the Far East, the Balkans, the Near East, Rhodesia and East Africa. At this stage, tobacco resembles dried leaves, varying from dainty little shapes to leaves a foot or more in length and ranging in colour from a dark brown to a pale yellow. It is carefully packed in casks, bales or cases; a post-war trend noticeable at the docks is a gradual decline in casked tobacco, almost invariably so packed in the U.S.A. and Canada, and an increase in baled or cased tobacco. This is due to the expansion in Empire production at the expense of the hard currency areas.

On discharge from the ship the packages are taken into warehouse at one of the great tobacco storage centres in the Port

of London; the Royal Victoria Dock, where the upper floors of the long line of modern three-story warehouses are in the main devoted to this commodity, the top floors of the warehouses on the North Side, King George V Dock, the East India Dock and the P.L.A. warehouse in Commercial Road East. Many of the warehouses referred to were specially designed for the trade. On arrival at the warehouse each package of tobacco is given a serial number, by which it is henceforth known and recorded until it finally leaves the port for the factory. The contents of all packages are weighed under Customs supervision, for upon the net weight of the tobacco will be assessed the duty payable by the merchant.

Sampling is one of the most important services performed by the staff of the P.L.A. at the tobacco warehouses. The samples are drawn from different parts of the package, and in colour, size of leaves, condition and texture must be truly representative of the quality of the whole of the contents. Samples are weighed and labelled and sent to the importer through the authority's sampling service. Garbling, the ancient name given to the process of separating sound from unsound tobacco, is also undertaken by P.L.A. staff.

When the cask, case or bale has been dealt with in the above manner it goes into storage in the warehouse for periods of up to 18 months or more. At the end of the year 1952, the P.L.A. held in its tobacco warehouses stocks to a total net weight of over 50,000 tons, representing a duty-paid value of well over £350 million. This huge stock is about 25% of the total stocks of tobacco held in the United Kingdom.

Rubber

Rubber is exempt from Customs duty and because of the post-war demand at least 50% is absorbed direct into consumption. This means that a large proportion of the commodity goes on what is known as quay delivery rate. Quay delivery rate covers immediate delivery, *i.e.* ship to rail or road or water transport. The authority merely performs the service of passing the rubber over the quay and through the shed, delivery being effected within the specified number of days. The merchant may lodge instructions asking for a particular rate to be applied, varying from the quay delivery rate to the full landing, warehousing and delivery charges.

In the event of goods requiring to be warehoused the parcel is transported up-river to London and St. Katharine Docks. Here the goods are unloaded and stowed to marks and numbers. A record is made of the stowage and each bale or case is weighed separately in pounds. Sampling is performed unless otherwise ordered by the importer—generally a 10% average—but, of course, this may vary according to instructions. Rubber sheet may be too hard for normal sampling and the authority have now provided an electrical oven for thawing out the bale to enable sheet sampling to be carried out.

Rubber is stored in No. 1 Warehouse, London Dock, fire risk precluding the stowing of other commodities. Rubber may be held for some considerable time and further operations may be required, *e.g.* resampling or second sample—usually after 12 months—and a reweighing order on delivery. On receipt of the goods a landing account is prepared recording in detail individual marks, numbers and weights, the original of which is sent to the merchant. As far as the ledger office is concerned, the landing account is entered and deliveries effected against the entry.

Conclusion

The foregoing is but a brief selection of the numerous categories of agricultural produce handled by the P.L.A.; it suffices, however, to show the importance to agriculture of the work of the port authorities. Inefficient or wasteful handling of merchandise at ports of entry or shipment can detract from the profits of export agricultural industry, and efficient and economically controlled port services are an essential prerequisite for successful agricultural development.

Photos : Port of London Authority

Sugar being discharged from ship to lighter

Pakistan Fertiliser Plant

The construction of a new fertiliser plant is to start at Daudkhel, Pakistan, in October. It is expected to be completed in three to four years. The plant is being designed by Union Chemique Belge S.A., of Brussels, and will produce 50,000 tons of ammonium sulphate a year. This will be used for the Indus River Valley food development programme. The cost of the plant is estimated at $13 million.

Unilever Expansion

Unilever Ltd. has taken over the management of East Africa Industries Ltd. and is preparing a programme of expansion, the first of which as a first step will be the manufacture of margarine from local raw materials. The agreement has been signed by representatives of the Industrial Management Corp. (a Kenya Government corporation), the Colonial Development Corp. and Unilever Ltd.

The Reclamation of Land Flooded by Sea Water

Continued from page 488

Farmers' reactions to the effects of flooding

The fact that the decline of structure is, in the first place, limited to the surface layers often encourages farmers to plough the soil deeply because they believe that it is only the surface layer that is affected. As, however, the draining of the soil is very slow in spring, they fear that they may not finish the work in time and they plough even damp soils. Development of structural deterioration then takes place in such a manner that farmers are naturally tempted, if they are not warned, to plough these damp soils very deeply and prematurely. The Dutch have coined a name for this procedure, which they term ' the devil's temptation.'

In 1948, in the Dunkerque area, the climatic conditions were favourable and the advice of the advisory officers was followed; as a result the deterioration of soil structure was but little marked and the harvest was unexpectedly satisfactory. Some farmers in the area imagined that their land had been completely regenerated and in the autumn resumed deep ploughing despite frequent and repeated warnings. The consequences were serious and were felt for a number of years afterwards. The surface layer which had been regenerated had been deeply ploughed beneath the soil and in consequence the work of regeneration had to be started all over again.

Continuous Cloches for Early Crops

J. L. H. CHASE

Cloche cultivation has long been practised, but continuous cloches are a more recent development. They have been most extensively used in Britain but their use in other countries is extending.

IT is just over 40 years since the first continuous cloche was invented and marketed. The designer was Major L. H. Chase, a civil engineer born in Australia and father of the author. The underlying principle behind the continuous cloche is to take glass protection to a growing crop instead of growing the crop inside a fixed greenhouse or frame. The principle was not entirely novel, for French market gardeners had for many years used a glass bell jar, or 'cloche,' to produce early salads and cauliflowers for the Paris market. These were about 24 in. wide at the base and there was no method of ventilation other than tilting them at one edge with a block of wood. Further, they were difficult to handle and very easily broken and, in any case, a large number of circles do not efficiently cover a rectangle of ground in which crops are growing.

Description

The continuous cloche was designed to protect rows of growing crops at their normal field or garden spacing. Each cloche is a rigid entity, weighing about 5 lb., and consisting of two or four sheets of glass held together by a galvanised wire framework. The continuous cloches butt together end to end to form long glass tunnels not more than 24 in. wide and of any required length. The ends of these tunnels are closed with sheets of glass to prevent through draughts.

The maximum width of the cloche is important, as the method by which water reaches cloche-protected crops is unique, although similar in principle to the methods of irrigation used in tropical countries. The surface of the soil in which the crops are growing under the cloches is never wetted, as it is in the case of open-air crops, or in greenhouses or frames. The rain falls on the glass roofs of the cloches, runs down the sides and seeps into the soil and so laterally to the roots of the plants. The result is that the soil never cakes under the cloches, and the original tilth is preserved. This means that hoeing to keep the surface soil aerated is unnecessary, and it also means that the soil temperature is considerably raised, for the fine surface tilth prevents frost from penetrating, even at very low temperatures.

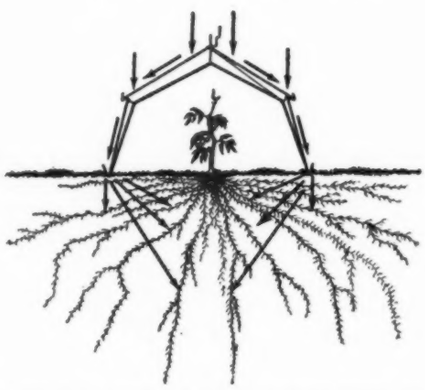
Advantages

Continuous cloches, being constructed almost entirely from glass, with a minimum of framework, offer practically no obstruction to the rays of the sun. This is most important in high latitudes, where one of the objections to growing in greenhouses and frames is that the plants do not receive sufficient light. Further, the light reaches plants under cloches from every direction, not only from above, but also from the sides. This means that growth will not be distorted vertically and there will be no 'drawing' of the plants.

Cloches offer tremendous protection against frost, particularly late spring and early autumn radiation frost, which usually follows a bright, sunny day. Under these conditions there may be as much as 15° F. difference in temperature between the air under cloches and the outside air, but in many countries it is not only against cold that plants need protection, but also against wind. It might be thought that, being comparatively small and light, individual cloches might be shifted by heavy gales. In practice this is not so. The shape is such that, provided the ends of the rows are kept closed and the cloches are put down evenly on the soil, there is no danger of wind damage.

Design

There has been remarkably little change in the design of cloches since the early days. The first model allowed a small amount of ventilation along the ridge and at the eaves. This was sufficient to ensure that there is always a slight movement of air, so that there are never 'fuggy' conditions under the cloches. Gradually, however, it was realised that cloches could be of value, not only for winter and early spring crops, but also throughout the summer, when more ventilation was obviously desirable. The modern cloche, therefore, allows extra ventilation to be given along the ridge, and it further allows one of the top sheets of glass to be removed to allow access to the crop growing beneath without moving the cloche itself. This is a great advance, and it has cut labour costs in using cloches on a commercial scale for many crops, particularly strawberries.



How rain and irrigation water reaches the crop growing under cloches

Early history

For the first 20 years continuous cloches were used mostly by amateurs, and almost entirely in the United Kingdom. In the north they were particularly valuable for protecting crops from rain during the cold, wet winter months. On the eastern side of the country protection from wind was particularly important and in the coastal areas from sea spray. Near industrial towns fog and impurities in the air prevent many crops from growing properly, particularly leafy subjects like lettuce and spring cabbage. Cloches give complete protection, though, of course, it is necessary to clean the glass from time to time, as it quickly becomes dirty in industrial areas. Throughout the country cloches were used to start early sowings and to bring on such important crops as strawberries, peas, beans and tomatoes three or four weeks earlier than outside. They also made it possible to grow crops like cucumbers, melons, capsicums and aubergines out of doors without a glasshouse.

Modern developments

It was not until the early 1930s that commercial market gardeners began to realise that cloches could be used profitably to produce early crops. They were first used for strawberries, lettuces and violets, but gradually their value began to be appreciated for a whole series of other market garden crops. During the second world war the demand for tomatoes increased enormously and it was soon realised that cloches were the cheapest and easiest way of growing this crop. Several million cloches were used for tomato growing during the war and produced tens of

A cucumber crop growing under cloches near Nelson, New Zealand

thousands of tons of tomatoes. Early in the 1940s, when shortage of labour began to become acute, a new technique was evolved for using cloches commercially, which saved a tremendous amount of labour. Instead of using the drift of cloches in a solid block over one crop and then, when that crop reached maturity, shifting all the cloches to another part of the field to cover a second crop, a new system called ' strip-cropping ' was introduced. In this method crops were grown in alternate strips of the same width, and when one crop no longer needed cloche protection the cloches were merely moved 6 ft. sideways on to the adjoining strip to cover the succeeding crop. This greatly cut down the time taken to handle the cloches and other ' drills ' were evolved for the rapid ventilation of the cloches and for working on the crops growing underneath them. It is now found that one man can work, single-handed, about 2,000 cloches, which are sufficient for two-thirds of an acre of ground.

Choice of crops

It must be understood that cloches are not used to cover a single crop in the year, but a succession of crops. In England, during the winter and early spring, the choice lies between lettuces, carrots, asparagus, peas and radishes. The first crop is succeeded during April and May by a half-hardy crop, usually one of the following: tomatoes, french beans, runner beans, marrows or sweet corn. The third crop is a summer crop, which covers the plants from June onwards. This may consist of a late crop of tomatoes or melons, cucumbers, capsicums or onion sets.

There are also a number of profitable flower crops which are grown with cloche protection. The most important are sweet peas, larkspurs, pyrethrum, scabious, dahlias, zinnias, anemones, violets, daffodils, tulips, iris and gladioli. Some of these crops need more height than is afforded by the continuous cloche in its normal position. This is provided by using what are called elevators, which effectively raise the height of the cloches by about 12 in.

Some crops are grown throughout under cloches from sowing until harvesting, but the majority of crops are merely started under the glass and then allowed to finish in the open. Half-hardy crops, for example, can be sown or planted five weeks before the danger of killing frosts has passed. At the end of that period the cloches can be removed and the plants can grow on in the open in the normal way. Strawberries, on the other hand, are clothed for three months only, from March until picking ends at the end of May. During the rest of the time the runners are growing in the open without any protection.

Capital costs

In the United Kingdom, the capital cost of installing cloches to work an acre of ground is between £800 and £900, about half the cost of the same area of Dutch light frames, and a tenth of the cost of a similar area of cold greenhouse. The annual gross return from this area works out at between £1,000 and £1,500 a year, compared with £100 to £200 for intensively grown, unprotected market crops. The labour used to work such an area is from one to one and a half men, depending on the nature of the crops grown and the amount of mechanisation available. This labour cost of £300 to £500 a year for an acre is about a third of the annual gross return, and this proportion compares very favourably with any other form of horticulture. Further, there is far less trouble with disease than with frames or glasshouses, probably because the method of ventilation and watering is more natural. It is also found that there is less trouble from pests under cloches, possibly because the method of strip cultivation, where two different crops alternate on the same ground, gives more control against pests than when a single crop occupies the entire field.

In practice, glass breakages are found to be very small, averaging less than 5% per annum. The life of the metal fittings, which hold the glass together, is about 20 years, though in highly industrial areas, where there is a high percentage of chemical impurities in the air, their life may be somewhat shorter. It is estimated that there are about 15 million cloches in use in the United Kingdom, which works out at one-third of a cloche per head of the population. It is thought that this figure could economically be raised to one per head. Of these cloches, it is estimated that about two-thirds are used by commercial growers and one-third by amateur gardeners.

Developments outside Britain

(a) New Zealand

Such a density of continuous cloches per head has not yet been achieved in any other country in the world, but it is fast approaching this figure in New Zealand. This is remarkable, for it is only six years since the first continuous cloches were put on sale in that country. In 1946, an English market gardener, Mr. A. G. Merfield, migrated to New Zealand and started a cloche holding just outside Nelson. He proved to be a pioneer and an enthusiast and he offered his services to the New Zealand Fruit Growers' Federation, who were marketing continuous cloches in the Dominion. During the last five years he has lectured to commercial growers in every town in both islands. Thousands of growers have visited his pilot holding and he has regularly broadcast and written two full-length books on commercial cloche working in New Zealand. The result is that several hundred thousand cloches are already in use in the Dominion, where the climate is such that crops benefit as much from cloche protection as they do in the United Kingdom. There are few greenhouses in New Zealand, and there is no competition for the native commercial grower, as there are no imports of early fruit and vegetables. Enthusiasm for continuous cloche cultivation is so great that after six years a density of one cloche to

every five persons has already been achieved, and there seems no doubt that now that import restrictions have been eased the United Kingdom density will be passed.

(b) The U.S.A.

In the United States, continuous cloches were first marketed in 1950 and in that country they are called ' P.M.G.s '—portable miniature greenhouses—although I believe that P.M.G. is frequently translated as poor man's greenhouse, perhaps an even more apt description! In the United States, the interest is chiefly among amateurs, for there is little chance for the commercial man to sell early produce of his own growing, since he always has to compete with produce grown further south and rapidly transported by rail. However, interest is rapidly growing, particularly among those who believe that the quality of fruit and vegetables organically manured is superior to that of mass-produced crops grown commercially and fertilised with chemicals instead of with natural manures.

(c) Canada

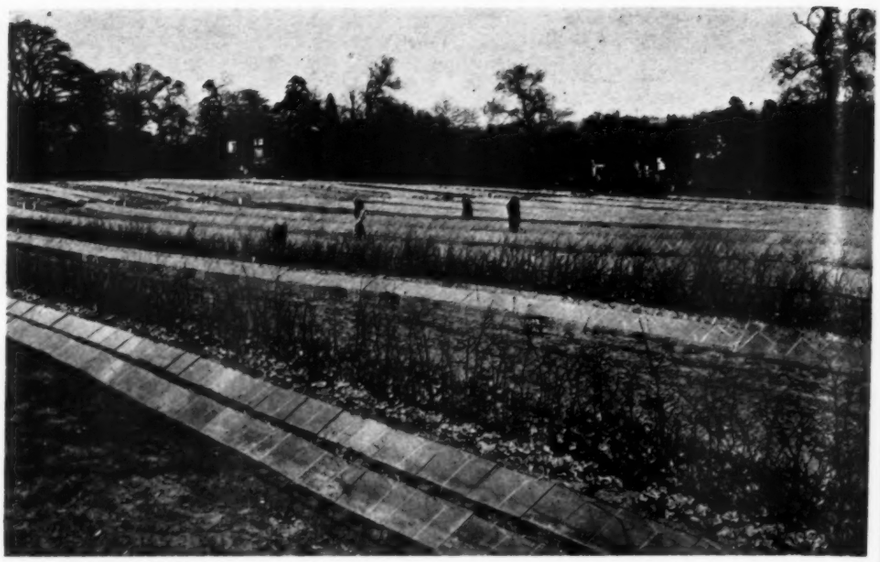
In Canada, the greatest interest has been shown in British Columbia, for in Eastern Canada the spring is so short that cloches only have a limited value in the production of early crops. Nevertheless, experiments have been carried out for several years at Guelph College of Agriculture in Ontario and cloches have been found to be extremely valuable in growing early tomatoes and some other crops.

(d) France

In France, the continuous cloche made little headway at first against the old-fashioned and traditional method of production of early crops. It was felt that they would be most valuable for strawberries and melons, but market growers in the south of France are now showing considerable interest in the use of cloches for growing early french beans, for which there is always an assured market.

(e) Sweden

In Sweden, after two years' successful experiment at the horticultural station at Alnarp, outside Malmo, cloches have been introduced and are becoming extremely popular. From a commercial point of view, their chief interest at present is for producing strawberries for the mid-summer holiday, when they always command very high prices. There seems to be room for expansion in the use of cloches in Scandinavia and cloche cultivation is becoming popular in Finland, although it receives occasional setbacks because of temporary glass shortage.



Cloches on a commercial holding in Surrey, showing method of strip cropping

(f) Cyprus

Rather surprisingly, cloches are proving of value commercially in Cyprus. Although the general standard of living is not very high in the island, there is a constant demand for tomatoes and cucumbers, which cannot be produced during the winter months without the use of glass. During these months very high prices prevail and cloches have proved at the Government experimental station to be capable of producing both these crops of excellent quality right through the winter months.

Outlook

Cloche cultivation has been practised successfully in countries as far apart as Iceland and the Falkland Islands, but there are still many lands to conquer, and in another 40 years' time continuous cloches may be as common a sight in the gardens of Chile, South Africa, Germany and Japan as they now are in the United Kingdom.

English Farmers' Meeting

A meeting was held on October 12 in London between the Chancellor of the Exchequer, the Lord Privy Seal, the Minister of Agriculture, the Secretary of State for Scotland, the Minister of Food, the Parliamentary Under-Secretary of State, Home Office, the Parliamentary Secretary, Ministry of Agriculture, and representatives of the National Farmers' Unions of the United Kingdom to discuss current agricultural problems and the anxieties of farmers.

Ministers reminded the farmers' representatives of the statement made the previous week at the Conservative Party's conference by the Prime Minister that ' the system of guaranteed prices remains, and will remain, though sometimes in a changed but more flexible form than at present '; and that the Minister of Agriculture amplified this by saying that ' the Government will fully maintain the value of the industry's guarantee under the 1947 Agriculture Act and give equal economic stability to the industry.'

The immediate problems before the industry with regard to guarantees of price and market were considered commodity by commodity. The Government reaffirmed its willingness to consider proposals for fitting producer marketing schemes into the new arrangements. A basis for further discussions on the marketing of commodities was agreed.

Representations were made about the special circumstances of Northern Ireland and the remote parts of Great Britain and a request was made that they should be taken into account, and it was agreed that these merited further consideration. Detailed discussion of all these points will be continued between representatives of the Government and of the National Farmers' Unions.

The Effects of Organo-Mercurial Fungicides on Sugar Cane Cuttings

The practice of dipping cane setts in fungicide prior to planting has long been followed. Early in the present century, following experimental work in the West Indies and elsewhere, their immersion in Bordeaux mixture as a protective against pineapple disease was widely practised. More recently, it has been shown that organo-mercurial fungicides offer great advantages in this connection and they have in many parts of the world superseded Bordeaux mixture. In the following article, a résumé of the results achieved is given.

FOR some years now it has been the practice in most of the sugar-growing areas of the world to treat cuttings prior to planting with some sort of disinfectant as a precaution against the onset of fungus diseases in general, and pineapple disease (*Ceratostomella paradoxa*) in particular. These precautions have shown themselves to be worthwhile and effective to varying degrees, depending on the type of fungicide used, with the organo-mercurial compounds as top favourites.

Growth stimulations

It has been noted that certain of these organo-mercurial compounds exhibit a double effect on the young cane plants and that not only do they keep down the incidence of fungus infection, but they also appear to stimulate the rate of development of the young plants, ensuring a much better germination and vigour of growth generally. Whether this stimulus is a direct effect of the organic chemical on the metabolism of the plant, or whether it is chiefly due to the elimination of harmful effects produced by soil micro-organisms (without harming the plant) is not known.

Some years ago it was noticed from investigation into the cause of germination failures that these failures were primarily caused by fungi and bacteria fermenting the tissues of the young cane cutting. The micro - organisms responsible for this damage are in the soil, on the outside of the cuttings, or in the inside of the latter at planting time. It followed, therefore, that if the cuttings were dipped in some suitable disinfectant before planting the incidence of fungus disease would probably be reduced; this has, in fact, been found to be the case, a good measure of control of the commonest disease of cuttings, pineapple disease, having been obtained.

South African results

Of all the disinfectants tried, there is now no doubt that those containing some form of organically combined mercury give the most satisfactory results. In Natal, for instance, work carried out at the experimental station, Mount Edgecombe, with a number of fungicides showed that it was only necessary to give the cut end of the cutting a protective coating of the organo-mercurial fungicide, the duration of the treatment merely being an ' in and out ' dip. The experimental plots had been planted in a sandy soil during August in the middle of a drought and, in spite of this, marked improvement in germination was obtained. One pound of ' Aretan ' * in 20 gal. of water so stimulated the rate of development that much more vigorous tillering was produced. These experiments showed, therefore, that not only did the fungicide have the effect of suitably reducing incidence of disease, but it also ensured a good stand of cane, despite conditions of drought. This latter point is interesting and of great practical value, because if no treatment had been given planters would have had to wait for rain and therefore delayed their planting programme.

A Bantu dipping cane setts in ' Aretan ' solution. The quantity of solution is kept at about a depth of 3 in. in the barrel

Mauritius

In the sugar-growing island of Mauritius, too, an extensive programme of field experiments was undertaken with the object of testing the efficiency of selected organo-mercurial compounds compared to standard estate practice on the germination of cane setts. Data were obtained on the various factors responsible for the failure of setts to germinate.

In Mauritius, the three major factors in the failure of setts to germinate are, in order of importance, pineapple disease, chlorotic streak and red rot. The treatments under test had no effect on the two latter diseases, since they are caused by an infection in cuttings of a different type. Lime water treatment by soaking setts for 24 hours decreased the incidence of the disease, probably by accelerating the germination of buds and roots. Treating ends of cuttings with powdered lime also had some effect in reducing the disease, although this was less apparent under dry conditions.

The addition of molasses at planting lowered the incidence of pineapple disease, possibly by creating soil conditions favourable to the development of micro-organisms antagonistic to *Ceratostomella paradoxa*.

It was, however, the organo-mercurial compounds which significantly reduced the incidence of pineapple disease and they are preferred because of their more powerful fungicidal action and simplicity in use. ' Aretan ' was reported to have a marked stimulating action on germination and growth.

*' Aretan ' is a trade mark of Bayer Agriculture Ltd., London. The product is sold in certain territories under the name ' Clerit '.

Queensland

In Queensland, experimental treatments on cane setts have been carried out since the 1949 season and results are reported to have been uniformly excellent. The solution used contained 0.015% of mercury in an organic form and it is recorded that 'Aretan' was found to be the most generally useful. Here a study of the economics of dipping procedures in planting showed that, although extra labour was employed, the area planted per day was increased and the tonnage of plants per acre decreased. In short, it is cheaper to dip than not to dip and a big advantage is gained through having uniform strikes without the necessity for replanting, which is important in areas where reasonably good germinations are the rule rather than the exception. This mercurial dip was found to provide complete protection and, even where the disease was not usually considered to be a major problem, it ensured germinations when the untreated setts have virtually failed.

Germinating sugar cane setts, North Queensland: (*left*) 'Aretan' treated and (*right*) untreated

Cane dipping procedure

Cane growers have in many cases shown considerable ingenuity in organising dipping of their cane cuttings. One grower in New South Wales, for instance, has constructed a cutting, dipping and bagging plant, all in one unit, for dealing with the planting of an area of 100 acres per year. With this machine the plants are cut by a circular saw, dropped into a trough of mercurial solution, picked up by a conveyor belt and dropped into a bag. The outfit is mounted on a two-wheeled chassis, power being supplied by a 3-h.p. engine. The trough into which the plants drop holds 20 gal. of liquid, which has to be periodically replenished. Over a season's planting the expenditure of 'Aretan' came to less than ½ lb. per acre planted when used at the concentration of 1 lb. to 20 gal. Under this system the working team consists of four men handling up to 40 bags per hour.

The present position

Dr. A. A. McMartin, B.Sc., Ph.D., of the Mount Edgecombe Experimental Station, writing in the *South Africa Sugar Journal*, has said:

'While the purpose for which a preplanting dip was first recommended was the control of diseases—principally pineapple disease—of cuttings, it has been demonstrated again that, apart from this, the use of such treatment can enable planting to be done under conditions normally considered sub-optimal as regards soil moisture; it would appear that when cane fails to germinate under such conditions it is not the lack of moisture as such, but the fermentation of the sett which inhibits development, and when this can be prevented the moisture in the sett enables root and shoot growth to proceed.

'For this purpose it is conceivable that different soils may affect the response to these fungicides, and also other factors, such as soil temperature, might be important; in addition, the concentration of the fungicidal dip may require to be varied according to conditions at the time of planting. These aspects of the problem can only be elucidated by further field trial, but growers could profitably try some of these brands for themselves and determine their suitability or otherwise for their own conditions.'

It is evident, therefore, that the practice of dipping cane in mercurial fungicide solution is spreading throughout the sugar cane growing areas of the world. The further effect of tillering stimulation which has been particularly noticed in the case of 'Aretan' is a valuable property which growers have not been slow to exploit. It is hoped that research will in time throw more light on the reasons for this phenomenon, which, when fully understood, may lead to its application to other crops in world agriculture.

Mechanical planting of sugar cane in South Africa

REFERENCES

1. McMartin, A. A.: 'Fungicidal Treatment for Sugarcane Cuttings,' *S.A. Sugar Jour.*, p. 651 (October, 1949).
2. Bates, G.: 'A Mercurial Dipping Plant,' *Cane Growers' Quarterly Bulletin*, p. 155 (April, 1953).
3. McMartin, A. A.: 'Fungicidal Treatment for Improving Sugar Cane Stands,' South African Sugar Technologists' Association (1945).
4. Evans, H., and Wiehe, P. O.: 'Experiments on Treatment of Sugar Cane Setts by Planting Under Mercurial Conditions,' *Sugar Cane Research Bulletin*, Mauritius, No. 19.
5. Bayer Agriculture Ltd., London. Private reports.

English Approved Seed Peas

A greater acreage than ever before was examined this year under the Dried Pea Seed Approval Scheme administered by the Home Grown Threshed Peas Joint Committee with technical assistance from the seed production committee of the National Institute of Agricultural Botany. Altogether 7,924 acres were inspected, compared with 4,551 acres in 1952. Of the total, eight growers' crops, comprising 54½ acres, were graded as Field Approved Foundation Seed and 254 crops, comprising 6,118½ acres, classed as Field Approved Stock Seed.

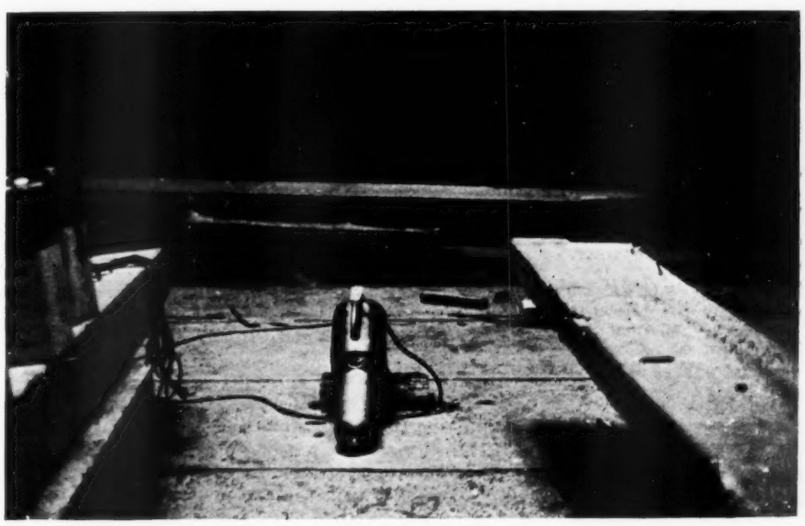
Disinfestation of Ships' Holds

In relation to the article on the work of the Port of London which appears on another page, a frequent source of difficulty is the infestation of ships' holds and warehouses by insect pests. This matter has been dealt with in previous articles in WORLD CROPS *(see Vol. 1, pp. 103 and 155). A new method of disinfesting ships' holds has recently been devised as a result of discussions between Mr. T. H. Clarke (Marine Superintendent of Chandris [England], Ltd.), and Mr. J. L. Hitchon, of Insecta Laboratories. This is described below in an article reprinted from our sister journal, 'Food Manufacture.' The method consists in the application of the fogging technique and the results demonstrate the applicability in such conditions.*

ONCE the original conception had been worked out, Mr. Clarke and Mr. Hitchon proceeded to occupy themselves with problems of its application. The requirements demanded for any proposed fumigation equipment were:

(1) It must be portable.
(2) It must be capable of dealing with widely differing shapes of ships.
(3) It must disseminate a light residual fog on all surfaces in a short time, without the necessity for the intervention of skilled operators.

As these requirements had been satisfactorily met by the use of Microsol mechanical fog generators in one form or another in other industries, notably milling, grain storage and food preparation, it was thought probable that such types of generator would be suitable for the present purpose.



One of the Microsol units in position in the No. 2 hold

Equipment and insecticide used

From the various models available, Model 202, electrically driven, was considered suitable to deal with the various sizes of ships' holds to be treated. The doubt as to whether the smaller particle size (60 Mμ) of the 'fog' would have sufficient velocity to reach high up to the underside of 'tween-deck holds from the floors of the main holds, a distance of between 40 and 45 ft., was dispelled after tests were made to evaluate the closed space output and throw characteristics, using Shell Risella 17 oil as the base material. The effect of using this heavy material was to slow down the throughput and sustain the particles intact for long periods, whereby the recirculatory and turbulent effect of the Microsol equipment could be used to the best advantage.

In order that the treatment would remain effective for some period between applications, the employment of an insecticide with special properties was necessary; in this connection, the advice of Mr. J. M. Holborn, of the Cooper Technical Bureau, was sought. It was eventually decided that the best material to use would be Pybuthrin 44, a non-toxic and non-tainting insecticide which has the additional advantage of activating the insects hiding in holes or crevices. In addition, it has a residual life, especially when used in dark locations; this life can be renewed easily with the Microsol frequent light-fogging technique which it was decided to adopt for this particular trial.

Selection of ship

For the trials, it was necessary to select a ship which had discharged its grain cargo and was in ballast or in dry dock, so that the whole test could be carried out in the presence of the ship's officers and the experiment repeated if necessary. Accordingly, arrangements were made by Chandris (England) Ltd. to carry out trials aboard the s.s. *Ivor Jenny*, a vessel of some 9,700 tons, which had recently discharged a cargo of grain. Arrangements were also made for Mr. J. D. Norris, the local representative of the Ministry of Agriculture and Fisheries, Infestation Division, to attend and make any further tests that might be necessary.

As it was necessary for the trials to be carried out with the support of the Canadian authorities, the ships concerned coming under docking facilities and infestation control in Canadian ports, it was arranged that Mr. Hitchon hold a watching brief and forward reports on the trials.

At a preliminary meeting on the day prior to the trials a full discussion was held, at which were present: Mr. J. H. Clarke (Marine Superintendent, Chandris (England) Ltd.); Mr. J. D. Norris (Area Inspector, Ministry of Agriculture and Fisheries); Mr. J. L. Hitchon (Insecta Laboratories Ltd.); Mr. J. M. Holborn (Cooper Technical Bureau); Mr. J. L. Procter (Cooper, McDougall and Robertson); Mr. E. Bennett (Leonard Hill Ltd.); Mr. W. Simpson (South American representative of Cooper, McDougall and Robertson); and Mr. J. F. Clancy and Mr. K. W. Hole (directors of Microsol Industries Ltd.).

During this meeting details of the technique of application were given and it was agreed that on the following day work on the most difficult application of all, that of fogging No. 2 hold, which has a total capacity, including shelter deck, of 140,000 cu. ft., should be carried out, the con-

tention being that if this were successful, then the other holds would be comparatively simple to treat.

Trial procedure

For the purpose of the trial three Model 202 mechanical fog generators with additional lengths of lead were used. The insecticide was Pybuthrin 44. While arrangements were being finalised, all the grain holds were surveyed and it was found that there was very little infestation, a tribute to the conditions of the ship since leaving a Canadian port loaded with grain some 30 days previously. It was also reported that there had been no time for cleaning the ship and that no cleaning down could be carried out in No. 2 hold before the trial. For the purposes of this trial only the lower hold was regarded as treated. The shelter deck would, in practice, require separate treatment.

While the equipment for the trials was being set up a preliminary demonstration with a Model 202 was given in the crew and officers' quarters, galleys and stores, during which a large number of pests were killed in a total running time of six minutes, the overall time including connecting, disconnecting and filling the generator being 15 minutes. The insecticide used was Pybuthrin 33, which is based on odourless kerosene.

Meanwhile, in No. 2 hold the entomologists made an inspection and Mr. Norris, accompanied by his assistant, Mr. Rhynehart, set out Petri dishes containing grain weevils, while Mr. Holborn placed filter papers at strategic points in the hold for subsequent determination of insecticide residues.

Rate of application of spray

Mr. Holborn stated that the recommended rate of application of Pybuthrin 44 as a residual spray was normally 1 gal. to 2,000 sq. ft. Therefore 10 gal. of insecticide should be applied in No. 2 hold, assuming that a proportion of the insecticide would reach the shelter deck. Since it was understood that two further treatments were to be carried out while the ship was in ballast at sea, it was finally agreed that 3 gal. of Pybuthrin 44 should be applied each time, *i.e.* a total of 9 gal. for approximately 20,000 sq. ft. (94,000 cub. ft.), and the former amount was used in the present trial.

At first sight, it did not seem possible that these three small machines, each weighing 12 lb., would in any way be capable of fogging so large a space without being moved about and carried on ladders up the sides of the hold. The three machines were started, arranged longitudinally along the starboard side, pointing into the fore and aft corners of the hold and abeam respectively. At the end of five minutes the starboard half of the hold was filled with a thick, penetrating fog which rose effectively from the three units. This continued until the hold was completely filled with the insecticide and the deposit started to form on various prepared surfaces, such as glass plates, and in the Petri dishes, where grain weevils had been placed. By climbing the limber boards it was possible to examine the density of the fog at the top of the hold, and at this point it became impossible to see any difference in density between the top and the bottom. Close examination by torch beam revealed that high turbulence and therefore velocity had been imparted to the fog and that the air recirculation and movement were sufficient to give impact velocity to the billions of droplets released into the air every minute.

Length of fogging operations

The machines each hold $3\frac{1}{4}$ imperial pints and it was therefore necessary to top up with Pybuthrin 44—easily accomplished without stopping the machines. Since masks were worn as a convenience and to avoid breathing in oil-laden air, those present stayed in the hold for 23 minutes, the time taken for the three machines to be discharged.

Refilling and replacing the machines took five minutes and the tests were then repeated on the port side. Before starting them, however, one machine was used for fogging the bilges. The boards were kept in positions except those at either end and the machine, used as a hand gun, was directed through the large holes in the supporting ribs in such a way that penetration was observed to the middle position. The second half of the hold was then fogged, this time taking 21 minutes.

Result of trial

An examination of the weevils in all the Petri dishes showed them all to be moribund or dead, and these were taken away for observation and the preparation of a report. The deposit on the test papers is also being reported upon.

The *Ivor Jenny* is proceeding to Hamburg, thence to Japan, and from Tokio it will be possible to carry out the technique while in passage to a Canadian port for loading with grain.

The following conclusions were arrived at as a result of the *Ivor Jenny* trials:

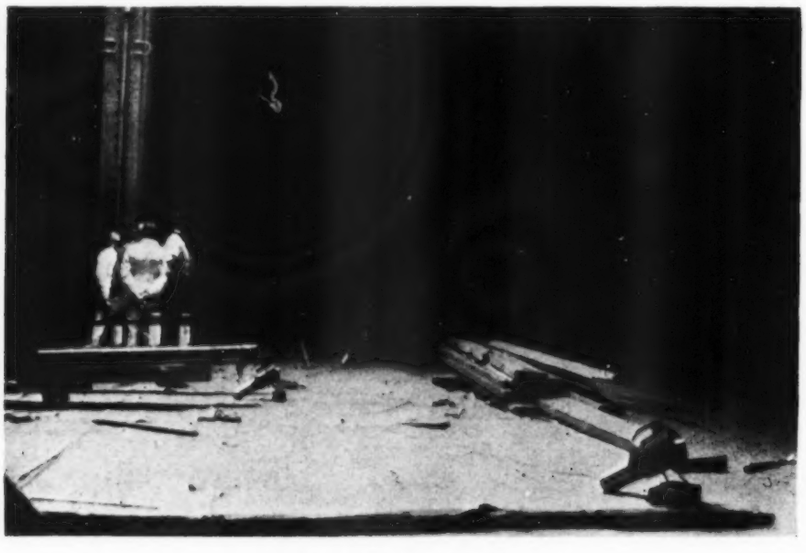
(1) The frequent light fogging technique using Pybuthrin 44 is feasible.

(2) The carrying out of the normal routine hygiene cleaning prior to spraying will greatly assist the effectiveness of subsequent hold spraying by Microsol units.

(3) Ships' personnel need no training to use the equipment, but must be shown how to clean out the machines after use.

(4) There is obviously a great saving in cost compared with gas fumigation methods in port. In conjunction with the latest rodent killing technique, the Microsol frequent light fogging technique is worth serious consideration by all shipping lines.

(5) In the accommodation of a ship it is possible, using a frequent light fogging technique, to clear away and hold down infestation at the cost of a few shillings per week.



The test in progress

Red Spider Mite Control

THE red spider mite has been for many years a serious threat to crops all over the world and each year causes many hundreds of thousands of pounds' worth of damage. It is, for example, the most serious tea pest in North-East India. In Britain, it is only during the last 25 years that the mite has risen to importance as a pest of fruit orchards, but is now a widespread and ever-growing menace, doing most damage to apples and plums. The damage done directly is to the leaves of the tree, causing them to discolour and go brown. This affects the condition of the next year's fruit buds and the following crop is seriously depleted. Early season attacks will affect the size and quality of the fruit the same year. The primary cause of the increase of the mite was the introduction of tar oil as a winter wash for fruit trees. This spray kills the eggs or hibernating adults of many insects which prey upon the red spider, thus allowing it to increase unchecked during the summer. The more recent introduction of DDT as a summer spray has aggravated the problem, for it destroys those enemies of the spider which have escaped the winter tar oil. The red spider itself and its eggs are not controlled by either tar oil or DDT.

An untreated apple tree which has been badly attacked by red spider

Chlorocide

For the last five years the research department of Boots Pure Drug Co. Ltd. has been working on the study of new compounds for the control of the red spider mite. This work finally resulted in the discovery about two years ago of the activity of chlorparacide, the active ingredient of 'Chlorocide,' which is claimed to give effective control of the fruit tree red spider mite, and the glasshouse red spider mite, which occurs on soft fruit and many other plants in the open as well as under glass, may be equally well controlled.

' Chlorocide ' is the trade name of formulated products containing 20% chlorparacide (p-chlorobenzyl p-chlorophenyl sulphide). This compound is a control for both winter and summer eggs as well as the larval stage of the mite. It is compatible at recommended rates of use with all other insecticides and fungicides and is available in two formulations, a miscible oil and dispersible powder.

Properties

The manufacturers claim that the compound kills the eggs and young newly-hatched mites. Spray deposits on the foliage act as a stomach poison to red spider larvae even at concentrations below those at which it will kill the eggs. Adult mites are not affected, but if ' Chlorocide ' is applied as recommended it will give an economic control throughout the season by reason of its persistent toxicity to eggs and larvae. The formulations have the property of diffusing across and penetrating through leaves to kill eggs and young mites which are not covered directly by the spray or are on the under surface. The active compound, chlorparacide, instead of breaking down in the leaf to inactive materials as is usual, is oxidised to form a secondary compound which, although it has not got the penetrating power of the original product, is of equal activity in the control of mite eggs and larvae.

' Chlorocide ' does not harm predators. It is not an insecticide and the toxicity to red spider mite is so specific that it does not kill the ladybird, the important predatory mite, *Typhlodromus*, or the black-kneed capsid bug. Extensive tests on the acute and chronic toxicity of the compound have shown that it is safe in practice. No danger exists to spray operators and spray deposits remaining on the fruit are non-poisonous. ' Chlorocide ' has caused no tainting on dessert or canned fruit, even when gross quantities were sprayed on the crop.

A branch of an apple tree which has been treated with ' Chlorocide '

Application

For the control of winter eggs and the newly-hatched larvae one application is recommended to cover the foliage at the green to pink bud stage, *i.e.* mid- to late April. It is advisable to spray as late as

possible pre-blossom, but before the winter eggs hatch, for by then there is the maximum amount of foliage present to retain the spray. Both formulations of ' Chlorocide ' have proved satisfactory when used through the usual fruit-spraying equipment and no special spraying precautions are required.

Overseas tests

The company states that ' Chlorocide ' is now in full production and will be available for commercial spraying next spring. Meanwhile, tests are being carried out in different parts of the world, including Australia, New Zealand and other Commonwealth countries. Control of the red spider mite on tea is being tried out in India and the new compound is also expected to be of use to citrus growers in California and South Africa.

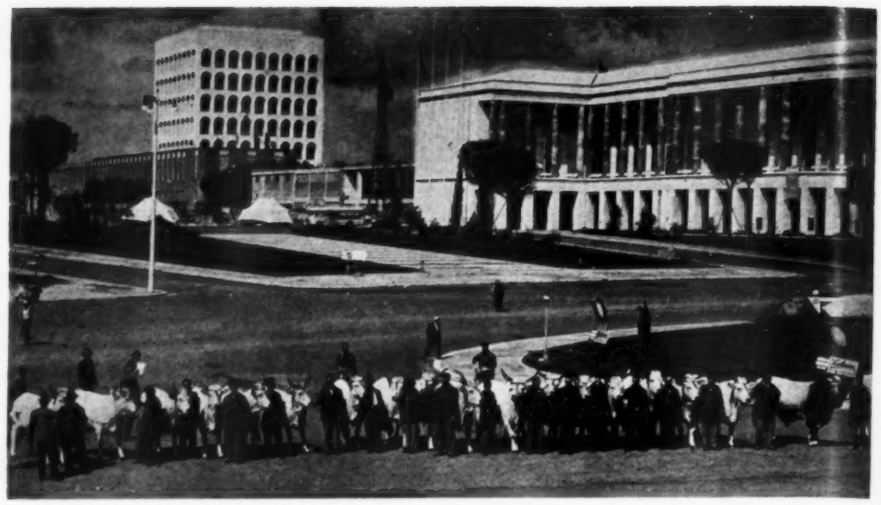
Some Italian Impressions

A senior member of the staff of WORLD CROPS has recently made an extensive tour of parts of Italy, during which he visited the International Exhibition of Agriculture in Rome, a brief note on which appeared on page 461 of our November issue, and the eighth International Exhibition of Processed Food and Packaging held at Parma. He also inspected certain aspects of agriculture in Italy and has supplied the following note of his impressions.

The International Exhibition at Rome

This was designed to illustrate the progress made in recent years by agriculture in Italy and the vital link between agriculture and industry. Much attention was devoted to showing the progress made in afforestation, as well as in road making and buildings in connection with the schemes for agricultural development in Southern Italy. A special feature was the pavilion of rice cultivation, which illustrated various aspects of the Italian rice industry. Other pavilions illustrated developments in Sicily, the production in Italy of natural and synthetic fibres, dairying, livestock raising and poultry raising in Italy and the activities of the great Montecatini combine. The Palace of Nations contained exhibits from 36 countries and various international bodies.

The exhibition is claimed to be one of the largest of its kind ever organised. The exhibition was organised under the authority of the Italian Minister for Agriculture and Forestry, Signor Salomone. The director of the exhibition was Signor Borromeo.



(*Top*) **Livestock shown at the International Agricultural Exhibition in Rome**
(*Below*) **Reafforestation on the Cinque Miglia Pass**

The International Exhibition and Congress at Parma

This exhibition was important, since it is the only one specialising in processed foods of all kinds on an international scale. The exhibits included processed products of all descriptions, raw materials and containers, as well as packaging materials and scientific implements for use in food industries. The conference was well attended and productive of some interesting papers, while the exhibition was very representative and instructive.

In the course of his subsequent tours our representative was much impressed *inter alia* with progress made in reafforesting the bare slopes of many mountains in Central Italy. We reproduce a photograph taken by him of one of these efforts.

Technical News

The scope of the December issue of **Fibres (Natural and Synthetic)** will come under the general description of the development of machinery used in the manufacture and processing of fibres. Among the articles in this issue will be ' The Working of Fibres,' ' Concerning Sisal Products ' and ' Developments in Processing Man-made Continuous Filament Yarns.'

In the December issue of **Manufacturing Chemist,** Dr. H. A. Fisher writes on Redex Indicators, and ' Synthesis of Adrenocortical Hormones ' is discussed by C. A. Finch, B.A.

RESEARCH DEVELOPMENTS

Foliar Spraying for the Application of Plant Nutrients to Crops

Of late years much interest has attached to spraying as a method of supplying plant nutrients to crops and in many places a large amount of experimental work has been carried out. The present position in this regard is dealt with in the agricultural section of the recently published Annual Reports on the Progress of Applied Chemistry for 1952 issued by the British Society of Chemical Industry, from which the following summary has been abstracted:

During the period under review foliar spraying for the application of major nutrients has been under investigation at Rothamsted and Long Ashton Research Stations in England, but at neither of these institutions have very definite conclusions as yet been reached. At Rothamsted it has not yet been decided whether assimilation by the plant can occur from residual dried deposits on the foliage. It has, however, been suggested that late spraying of the leaves of sugar beet with a 3% solution of ammonium nitrate may be beneficial, and experimental results indicated that such applications increased the protein contents of the tops by as much as 30% to 50%. Moreover, there were indications that late sprayings of this type would not have the effect of reducing the sugar contents of the roots, as would be the case if like dressings were applied to the soil.

At Long Ashton, on the other hand, it was shown that, in order to increase the protein content of the foliage of apple trees, spraying with urea solutions for two years in succession was needed before any significant results were observed.

It is concluded that the time at which the applications are made may have a very pronounced influence on the result, while it is conjectured that assimilation of nutrients by the leaves is only likely to occur when there is marked deficiency of a particular nutrient or nutrients within the plant itself.

On the other hand, when deficiency of trace elements in crops is caused by soil fixation it is agreed that foliar spraying may be the most effective method of remedying the deficiency. This last development, however, may be superseded by the use of organic compounds of trace elements applied to the soil. Thus the successful treatment of iron chlorosis of citrus crops has been reported from the U.S.A., making use of the ferric potassium salt of ethylene diamine tetra acetic acid as a soil application. Actually, ' chelated ' compounds of trace nutrients of this type are being manufactured and advertised.

Another recent development of this kind in the U.S.A. is the manufacture of fused granular mixtures of trace elements which have been termed ' frit fertilisers.' It is claimed that the slow release of the trace nutrients from them minimises the risk of soil fixation.

Sixth Hybrid Maize Meeting

We have received a copy of the report of the sixth hybrid maize meeting held under the auspices of FAO in Lisbon in February of this year. The report reviews the progress made by hybrid maize in various European countries. The figures of the report show that already a substantial contribution is being made by hybrid maize towards increasing grain production in Europe and it is recorded on lands where hybrids were grown an increase of a quarter of a million tons of grain valued at $24,000,000 has occurred.

This was achieved on only about 4% of the maize area in Europe and evidently there is abundant scope for further expansion of production. Certain of the figures which, at present, limit the use of hybrid maize in Europe are discussed in the report. Chief amongst these are inadequate facilities, both governmental and commercial, for the production of hybrid maize seed; insufficient provision for the breeding of hybrids better suited to European conditions; inadequate propaganda and instruction among farmers as to the advances and uses of hybrid maize and, finally, inadequate provision of staff for extension work of this type.

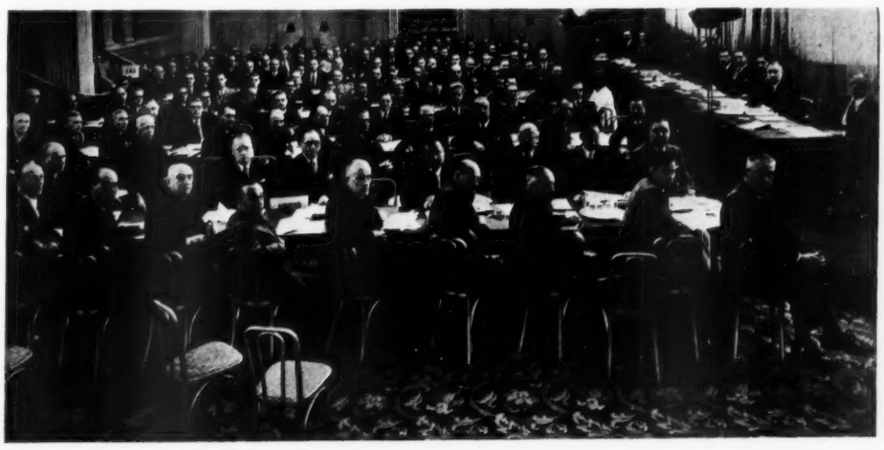
If the maximum benefit is to be obtained in Europe from the introduction of hybrid maize seed, the value of which it must be remembered has been completely established, it seems obvious that steps must be taken by European governments with the object of strengthening the provision of services for producing and popularising seed of this type.

Green Manuring in India and Pakistan

With reference to the article under this title by Dr. C. de Fellner, which appeared in our August number, our attention has been drawn by Dr. W. R. C. Paul, Assistant Director of the Ceylon Department of Agriculture, to some errors in the article.

The genus *Calopogonium mucunoides*, which was included under green manure trees and shrubs, is not a tree, but an annual creeping ground cover. *Tam* is described in the article as a trailing annual, while its name is given as *Indigofera endicaphylla*, it should be *Indigofera endecaphylla*. Dr. Paul questions if *Crotalaria striata* is used as a green manure crop on tea, coffee and rubber estates in India. The author of the article, however, assures the Editor that the statement in the paper is correct and that *Crotalaria striata* is definitely used as a green manure crop in Southern India.

Regarding the picture on page 320, Dr. Paul points out that its description as a Rhodes grass trial plot is also an error. This is correct and regretted. The author states that the picture is one of Napier grass (*Pennisetum purpureum*). It is easy to mistake Napier grass for sugar cane when seen from a distance at this stage of development.



A meeting of delegates at the recent Cocoa Conference in London, a report of which appeared in our last issue on page 449

NEW BOOKS

Research Workers in Agriculture

The List of Research Workers in Agriculture, Animal Health and Forestry in the British Commonwealth, 1953. Pp. 474. Commonwealth Agricultural Bureaux. 15s.

We welcome the appearance of a new edition of this invaluable reference book, which is indeed indispensable to all whose work is concerned with the vast amount of research on agricultural subjects now in progress in the various parts of the Commonwealth.

Since the last edition was published some five years ago there have been considerable additions to the ranks of the workers engaged in or concerned with agricultural research work in the Commonwealth and this finds its reflection in the size of the volume, which is distinctly more portly than its predecessor. This, too, is incontrovertible testimony to the esteem and importance which has become attached to research in agricultural and allied subjects in the British Commonwealth. Although the main format of the publication remains unchanged, there have been a number of minor new departures, of which the chief is the abandonment of the principle of classifying workers by key subject numbers, a procedure which was not invariably satisfactory, since there was inevitably some variation in the way this classification was used by those responsible for the compilation of individual lists in the first place.

The Agricultural Notebook

By Primrose McConnell, rewritten under the editorship of Prof. Ian Moore, with the collaboration of many authorities. Pp. 769. Farmer and Stockbreeder Publications. 1953. 35s.

Primrose McConnell's *Agricultural Notebook* has been a household word and an invaluable vade-mecum to farmers and agricultural students for more than half a century. The last edition was published in 1930 and it has been for many years out of print. Notwithstanding a constant demand for the book, it has not been possible to undertake the preparation of a new edition previously because of the upheaval occasioned by the world war.

The new edition is virtually a new book, which, while it contains many of the features which rendered the original work so valuable, has been revised and rewritten to take account of the many directions in which the practice and science of farming have made such rapid and notable progress during the past 20 years. It has entailed many additions to and enlargements of the scope and size of the work, which is now a thickish book of 769 pages in place of the slender volume we were accustomed to in our youth. Nevertheless, the format has been so modified that it could, at a pinch, be accommodated, as claimed in the publisher's note which accompanies it, in the farmer's pocket, provided that the latter is sufficiently capacious. Its utility is almost limitless and there is hardly a topic on which the practising farmer in the British Isles could turn for information to this work and not find all he requires.

For this revision, Prof. H. Ian Moore, M.Sc., Ph.D., Principal of Seale Haine Agricultural College, is responsible as general editor; he has been assisted in the preparation of the various sections by a team of 28 collaborators all well known in their own special lines and including such as Dr. W. Davies, Dr. John Hammond, Mr. D. P. Hopkins, Dr. Herbert Hunter, Mr. E. A. Johnstone and Dr. R. E. Slade. The book is fully indexed to facilitate quick reference and there is a glossary of scientific terms and 208 tables. The farming community are deeply indebted both to the editor, the contributors and the publishers for making this invaluable book available once more to the farming public in Great Britain.

The Empire and Commonwealth Year Book 1953-54

Edited by Ronald S. Russell, M.A., M.P. Pp. xviii + 453. Empire Economic Union. 1953. 45s.

This is the second edition of this work which has been compiled with the object of presenting in handy and convenient form summarised details of fact and statistics concerning every country in the British Commonwealth.

The work has been well done; it contains not only details concerning the different countries concerned, but also a separate section dealing with the principal raw materials and commodities produced in the Commonwealth and including summarised figures for production of each. It is essentially a handbook for the desk of the busy business man or administrator, to which he can turn for concise information on topics connected with Commonwealth affairs, safe in the conviction that in the somewhat unlikely event of his not finding what he wants in the book itself he will probably get a clear indication as to where it can be obtained.

The only suggestion for improvement is that the publication might be improved by the inclusion of maps of some, if not all, of the territories.

El Problema Mundial del Azucar

By Dr. Viriato Gutierrez Valladón. Published in Spanish. Second edition, 372 pages. Madrid, 1952.

In 1936, Dr. Viriato Gutierrez Valladón published the first edition of this book, in which he surveyed the world-wide economic problem of sugar. As the chief delegate of one of the leading sugar-producing countries, Cuba, at international sugar conferences in the 'twenties and 'thirties, the author had unrivalled qualifications for the task of surveying the development of the world sugar market after the first world war. The story was one of a gradual emergence from the chaotic conditions of war-time destruction and subsequent over-production, accompanied by cut-throat competition, to an era of international understanding and agreements on the vital economic problems which affected sugar - producing and sugar - consuming countries.

Only a few months after the first publication of this book the representatives of 22 nations in London signed an agreement which seemed to herald a period of economic peace and stability in this vital commodity market. All this was, of course, profoundly changed by the historic events of 1939, which plunged everything into chaos again, not only during the war years proper, but also for an equally long post-war period. It was only in 1952 that world sugar production was again able to meet the world demand and the possibility of over-production had to be faced.

It was then that the author thought the time ripe for a reissue of his book, obviously in the hope that the recollection of earlier events might prove useful background knowledge to those called upon to tackle a somewhat similar situation. Whilst the chapters forming the first edition remained largely untouched, the author has added two new chapters dealing with the 1937 convention and with the position of the world sugar market during and after the second world war. Extensive appendices contain the full (Spanish) text of the 1931 and 1937 conventions and the 1952 draft of a new convention.

Burning of Gorse

The burning of gorse in Britain is a regular and necessary practice on many farms. In order to prevent damage to bird life, farmers and others concerned are asked to avoid the nesting season and to complete their burning by the end of March.

Grain Drying, Storage and Handling Course

At the final meeting on October 3 of the course on grain drying, storage and handling held in the United Kingdom (see WORLD CROPS, November, p. 465) representatives of 11 European nations expressed their appreciation to the Organisation for European Economic Co-operation, the Foreign Operations Administration of the United States of America and Her Majesty's Government in the United Kingdom for organising this course and providing such excellent facilities for all participants. Members of the course also placed on record their warm appreciation of the cordial co-operation they had received from the staff of the Ministry of Agriculture and Fisheries and the many farmers and their trade associates with whom they had had the pleasure to work. Prof. Hege, one of the representatives from the Federal German Republic, in moving this resolution of thanks, expressed the hope that the contacts which all delegates had made during the previous four weeks would be maintained and that there would in consequence in the years to come be a continual flow of information amongst the European countries on grain drying, storage and handling problems.

The course

The course was designed to provide a study of the methods used and likely trends in the drying and storage of home-grown cereals on farms.

Delegates to the course had the opportunity of studying:

(1) The various methods of harvesting grain and removal from the fields and straw disposal, etc.
(2) The ways of dealing with threshed and unthreshed grain at the farmstead, reception, pre-cleaning, final cleaning, conveying, conditioning, drying and storage.
(3) The fight against insect infestation and rodent contamination of stored corn (wheat, barley and oats on the farm and in larger plants, *e.g.* the national grain silos).
(4) The transport of cereals off farms and their reception at silos, farmers' co-operatives, corn merchants' and maltsters' premises.
(5) The various types of buildings and machinery used.
(6) Marketing.
(7) The advisory services available to farmers.
(8) Work being done at research centres.
(9) The technique of grain handling from the milling and malting points of view.

Lectures and discussions

Two days each week were spent in lectures and discussions on the various aspects of the course. These lectures and discussions provided an ample opportunity for all delegates to be made aware of the problems of grain drying, etc., and the manner in which they were being tackled in the United Kingdom. It also provided delegates with an opportunity of discussing amongst themselves the problems that had arisen in the European field.

Visits

Three days each week were spent in the field. Eighteen farms were visited in Hampshire, Buckinghamshire, Warwickshire, Hertfordshire, Bedfordshire, Cambridgeshire and Suffolk. These visits provided the delegates with an opportunity of seeing at first hand installations suited to the various conditions throughout the United Kingdom and provided excellent opportunities for them to meet and discuss their problems with British farmers. In particular, the problems in relation to the use of combine-harvesters and the drying and storage of grain provided excellent opportunities for the exchange of information between delegates and farmers.

In addition, the handling of grain was seen off the farm at the premises of a flour miller, a national grain silo, a maltster, two corn merchants and a large farmers' co-operative. Visits were also made to the National Institute of Agricultural Engineering, the National Institute of Agricultural Botany, Rothamsted Experimental Station, and the Pest Control laboratory of the Department of Scientific and Industrial Research.

Damascus Locust Meeting

Concerned by the spread of desert locusts which have threatened African, Near and Middle Eastern food supplies for three years, the Food and Agriculture Organisation of the United Nations called an international meeting at Damascus on November 5 to co-ordinate countermeasures. The countries invited were Afghanistan, Bahrein, Egypt, Ethiopia, France, India, Iran, Iraq, Italy, Jordan, Kuwait, Lebanon, Libya, Muscat, Pakistan, Qatar, Saudi Arabia, Spain, Sudan, Syria, Turkey, the United Kingdom, the U.S.A. and Yeman.

The Food and Agriculture Organisation states that it is essential to halt the locust spread from the desert breeding grounds to farmlands. The present main concentrations are in India, West Pakistan, South-West Arabia and East Africa. Countermeasures are proceeding in these areas, but the difficult terrain makes inevitable the escape of some swarms to Arabia, where the attack must be renewed on an international scale. The meeting aimed to co-ordinate contributions of transport, insecticides and manpower funds.

European Farm Radio Conference

The European FAO-BBC three-day Farm Radio Conference held during August in London, with participants from most European countries and observers from seven international organisations, was probably the first step towards closer co-operation and exchange of ideas between men in charge of farm radio services. At the final session the chairman, the BBC's John Green, congratulated FAO on having taken the initiative in the matter of the conference and pointed out how welcome it had been among participating countries.

The conference recommended FAO, in consultation with OEEC and other appropriate international organisations, to convene a conference in 1954 or 1955 on farm and rural broadcasting and television. This conference should include a report by FAO on farm and rural broadcasting in Europe, a professional 'workshop' for broadcasting and extension workers and a business meeting to consider methods of technical co-operation on farm and rural broadcasting and television, with possible provision for a permanent organisation.

The conference recommended FAO to draw the attention of governments:

(1) To the vital role which radio and television play, and can play, in providing agricultural news, technical, educational and advisory work, and entertainment for farm people, and in widening their interests.

(2) To the fact that radio helps an otherwise isolated section of the community to keep in touch, and this is an important indirect factor in promoting a mental climate for agricultural and rural progress.

(3) To the complementary value of formal specialised programmes and informal programmes which combine entertainment with technical advice, particularly as such informal programmes tend to interest the townsman in agricultural matters.

(4) To the importance of training in broadcasting and television techniques.

(5) To the need for each country to have a section in the appropriate organisation to act as a focal point for farm and rural broadcasting and television.

FARM MACHINERY

Spraying Circus

A spraying circus, organised by Drake and Fletcher Ltd., has been touring the greater part of the English counties since October giving demonstrations of the company's spraying machinery under local conditions at various centres. In all, over 20 different machines will have been demonstrated to cover every type of spraying, representative of the company's range. The last demonstration takes place at Ormskirk, Lancashire, on December 1 and 2.

Mechanical Stonepicker

Because of the high cost of labour, many farmers in areas where stones are a problem have had either to abandon the use of the worst fields or work them with the subsequent breakage of implements and poor crop harvests. A mechanical stonepicker, however, is now available from Bridgeport Implement Works Inc., Stratford, Connecticut.

'Pixtone' is a two-wheeled trailer-type machine that is pulled by any two-plough tractor. No power take-off or hydraulic mechanism is required. The picking mechanism is driven by a separate 3/6-h.p. air-cooled engine which is said to provide steady power and action regardless of tractor speed. Controls for dumping and closing the box are operated by the driver from the tractor seat.

An adjustable rake goes along the surface of the ground and picking teeth spaced 1½ in. apart and revolving at 90 r.p.m. throw the stones against the circular rake teeth, which they follow around until they are thrown into the stone box. Stones from 1½ in. to 8 in. in diameter are picked by this ingenious machine. The picking teeth are controlled by torsion springs which absorb shock. A slip-clutch is provided which permits the teeth to stop instantly should the machine become overloaded.

When the machine is loaded—it carries 2,500 lb.—the rake is raised and the machine pulled to the dumping spot. The stones are dumped automatically by tripping a lever. The stones can be spread in a flat layer. Another lever closes the box and the machine is ready for another load.

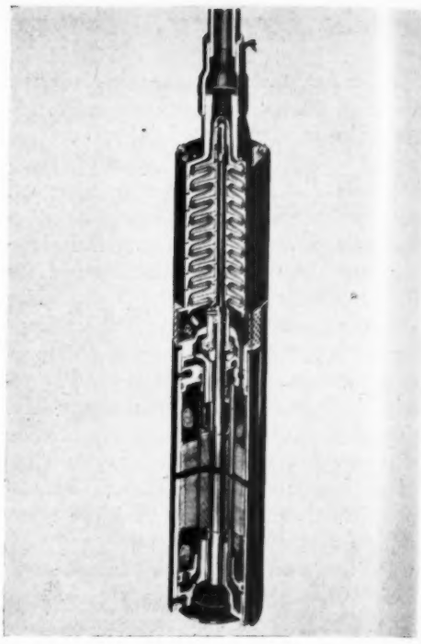
Air-cooled Engine

The Wolseley Sheep Shearing Machine Co. Ltd. has been making engines for over 50 years, designed primarily to meet the requirements of the farm industry, and its latest model, the air-cooled engine, has all the features of the hopper- and tank-cooled engines. In addition, it has a number of special features. The full range of 1½-5 b.h.p. can be obtained without changing the governor weights, but by a simple adjustment of a knurled screw. The conversion to paraffin is effected by:

(1) The addition of a special very easily fitted elbow which diverts hot air emerging from the cooling fins into the carburettor.
(2) The fitting of a two-compartment fuel tank.
(3) The insertion of an additional gasket under the cylinder head.

This is said to give particularly satisfactory running on paraffin. As in the case of the hopper- and tank-cooled engines, this model can be run with one or two flywheels and a drive taken from either end—an unusual feature in an air-cooled engine of this size.

The Pixtone mechanical stone picker is said to pick up stones from 1½ to 8 in. in diameter



The G.P. Sumo pump, which has a capacity of 400 gal. an hour

Submersible Water Pump

A ½-h.p. electric submersible water pump has been produced by Sumo Pumps Ltd. It is said to have all the constructional advantages of the large Sumo pumps and is expected to prove invaluable to small users of water at home and overseas.

The pump gives all the advantages of a piped supply of water for domestic users, wherever there is electricity, as it operates from normal electric supply. Sufficient water can be pumped to supply all domestic needs, including baths, hot water and water closets.

Other important uses for the pump will be found in cattle watering, milk cooling and for washing down dairies, and in irrigating gardens, market gardens and crops.

The capacity of the pump ranges from 400 gal. per hr. at a head of 30 ft. to 100 gal. per hr. at 100 ft. Installation is simple and with the pump's light weight of 32 lb. it can be lowered into position by hand. For pumping from ponds the unit need not be vertically placed, so it can be used with a shallow supply. Supporting clamps can be supplied and there are no priming difficulties. No surface structure is required. The pump can be put in any convenient position, and even built over if the ground is needed for other purposes.

WORLD CROP REPORTS

SOUTH KOREA

Rice crop. Rice was transplanted under favourable circumstances throughout the Republic of Korea in July. Rainy weather during June and the availability of fertiliser supplies for rice seedbeds resulted in bright prospects for a good crop in 1953. Observers who participated in a summer grain crop survey of June 11 to 25 estimate that all the 3,050,000 acres of available paddy land was planted in rice this year, as well as some fields not usually considered paddy land. Given normal crop conditions, a production of between 6,400 and 6,900 million lb. of rough rice should be harvested. South Korea is estimated to have produced in 1952 around 6,400 million lb. of rough rice from 2,280,000 acres.

SWEDEN

Rapeseed. It is expected that Sweden's 1953 output of rape and mustard seed will be around 100,000 short tons, or sharply below earlier forecasts and less than half the revised 1952 estimate of 208,000 tons, according to the American Embassy, Stockholm. Although flaxseed production in Sweden also continues to decline, the latest estimate for 1953 of 8,800 tons (315,000 bushels) is somewhat above previous forecasts for the year.

The general decline in oilseed production since 1951 has been due mainly to a shift in acreage from oil crops to breadgrains because of changed price relationships and increased occurrence of insects and diseases. The latter cause has resulted in a gradual movement of the centre of oil crop cultivation toward the north, where infestation is less pronounced. However, the cultivation of oil crops in central Sweden is not so attractive as in the southern areas because of lower yields and higher risk of winter damage.

SPAIN

Rice. The 1953 rice crop of Spain was transplanted under favourable weather conditions and prospects indicate a larger outturn will be harvested than in 1952. The crop is forecast at around 785 million lb. of rough rice, as compared with 715 million lb. a year earlier, although the planted acreage is estimated at 158,000 acres, or about the same as the 159,000 acres planted in 1952.

Fertilisers have been readily available this season and the per acre yields of the provinces are estimated to be higher than last year, especially in Valencia. The crop may have been ready for harvesting to begin in early September.

Distribution of the 1952 harvest in terms of milled rice is estimated as follows (million lb.): consumption of Spain and Spanish African possessions, 317; exports, 137; stocks on hand—growers, 9; stocks on hand—Rice Federation, 15; total, 478.

MEXICO

Bean crop. The 1953 bean crop in Mexico is expected to be no larger than the approximately 4 million bags harvested in each of the past two years, according to recent reports from Mexico City. Drought and cold weather have again retarded growth of the crop. The 1950 harvest totalled about 5,500,000 bags.

Because of recent short bean crops, Mexico has imported at the rate of over 1 million bags per year since late 1951, mostly pintos and pinks from the United States. The demand for imports apparently will continue strong in Mexico another year at least. This might offer an outlet for some of the large crop of pintos expected this year in the United States. In recent months, however, Mexico has turned to other sources for imports of beans, principally Africa and a few from Japan.

CANADA

Flaxseed. Canada's 1953 flaxseed crop is forecast at 11,187,000 bushels on the basis of yields indicated August 1, according to the Dominion Bureau of Statistics. This volume of production would be 1,774,000 bushels or 14% less than the 1952 level, with the decrease mainly attributable to smaller seeded acreages in each of the flax-producing provinces. Total plantings, estimated at 1,036,000 acres, are down, also 14%, from 1952. The indicated average yield of 10.8 bushels per seeded acre is practically unchanged from last year.

INDONESIA

Estate output. According to data of the Indonesian Central Office of Statistics, estate outputs amounted to the following:

	Production (in thousands of kgm.)					
	1938	1950	1951	1952	1953 Jan./May	1953 May
Rubber	175,078	178,076	226,383	297,922	128,365	23,224
Tea	80,538	35,384	46,513	36,995	15,042	2,798
Coffee	45,479	11,111	12,055	12,549	1,722	1,315
Cinchona bark	10,955	5,708	9,080	3,601	508	76
Cocoa	1,584	858	908	798	594	405
Sugar	1,375,510	277,091	427,059	458,029	46,105	42,629
Palm oil	226,668	126,491	121,147	145,995	63,947	11,433
Palm kernels	48,036	30,775	29,965	38,509	17,386	2,878
Hard fibres	40,769	7,025	16,581	30,261	12,201	2,137

U.S.A.

Flaxseed. Prospective production of flaxseed declined during August. A 1953 crop of 39,011,000 bushels is now indicated, 3.2 million bushels less than forecast on August 1. However, it is a fourth larger than the 1952 crop of 31,002,000 bushels and 2% above the 10-year average. The indicated yield of 8.9 bushels per acre for the U.S. as a whole is 0.5 bushel less than last year, but the acreage for harvest is a third larger, which accounts for the greater production.

Yield prospects deteriorated in all three of the important flaxseed States—North and South Dakota and Minnesota. Hot, dry weather during August hastened maturity and reduced prospective yields below those expected earlier. Harvesting operations were being rapidly completed in southern areas of Minnesota, with yields generally disappointing, but were just getting under way in northern counties. In North Dakota, about three-fifths of the acreage was still standing on September 1, but most of the uncut acreage was ripe or nearing maturity. The hot, dry weather during August reduced yield prospects in North Dakota by a half-bushel per acre, but at the same time largely eliminated the danger of losses from frost damage on considerable late seeded acreage. In South Dakota, harvest was progressing rapidly with about half of the acreage threshed or combined by September 1.

Soya beans. Production of 280 million bushels of soya beans, as expected on September 1, is 5% less than forecast in August. The current estimate is 4% below the 292 million bushel crop of last year and is the smallest since 1949. The record soya bean crop of 299 million bushels was harvested in 1950. An average yield of 19.5 bushels per acre is expected this year, well below the 20.7 bushels last year and slightly below the 10-year average of 19.7 bushels per acre.

Continued drought and extremely hot weather during the last week of August damaged soya beans over much of the southern part of the main soya bean area. The drought centred in Missouri, where

production prospects dropped sharply from even the relatively low estimate of a month ago. The Kansas crop also deteriorated rapidly during the month and an extremely low yield is indicated for that State. In the northern soya bean areas conditions were much better. The extreme heat of late August caused some damage, but it also hastened maturity, which lessened the possibilities of injury from early frost.

Growers in Ohio reported an unusually high condition as of September 1 and indications point to a yield of 22.5 bushels per acre in that State, a slight increase over August 1. Minnesota, where moisture has been adequate, also reported improved conditions over a month ago. Hot weather of late August hastened maturity, which virtually eliminated the danger of frost damage. The Indiana yield held at the August level; drought in the southern part of that State caused some damage, but relatively few soya beans are grown in that area. Illinois indications point to a yield of about 23 bushels per acre, 1 bushel less than either last month or last year. Soya beans in the southern counties of Illinois suffered rather heavy drought damage, but over much of the State prospects as of September 1 remained good. Combining had started in southern Illinois, with the first sales reported during the last days of August. In Iowa dry weather in the southern part of the State caused further damage to the crop; however, conditions in the heavy soya bean producing areas of the State remained relatively favourable. The indicated yield of 22.5 bushels is down only 0.5 bushel from last month, but is 3 bushels below the record yield of last year.

The South Atlantic States showed little change in yield prospects from the previous month. Dry, hot weather caused some deterioration in the Virginia crop, but this was offset by improved prospects in both Delaware and Maryland. In the South Central States, dry, hot weather continued over much of the soya bean area.

Cargill Crop Bulletin

WORLD

Barley and oats production. World production of barley and oats in 1953 is less than last year but above average, according to information reaching the Foreign Agricultural Service of the U.S. Department of Agriculture. The combined total is estimated at 128.8 million short tons, compared with 132.9 million in 1952. and the prewar average (1935-39) of 126.6 million tons. Most of the reduction from the 1952 total is in oats, with a comparatively small decrease in barley. Compared with the pre-war period, a substantial increase in barley more than offsets the decline in oats.

World barley production for the current season is forecast at 2,720 million bushels, compared with 2,745 million bushels last year and the 1935-39 average of 2,365 million. Increase over the pre-war barley acreage is reported for all areas except the Soviet Union. Generally, larger yields than in the pre-war period also contributed to the production gain. Oats production is forecast at 3,970 million bushels. This is 5% below the 1952 outturn and 9% less than the 1935-39 average of 4,365 million bushels.

North America's harvest of barley is slightly below the 1952 production, but is 56% above the pre-war average. The sharp rise above the pre-war level is mainly due to the increase in Canada, where barley acreage has more than doubled since the 1935-39 period. Yields in Canada for recent years have been considerably above those of the pre-war average, adding to the production increase. Barley production in the United States shows little change from the 1935-39 average, despite a substantial reduction in acreage.

The production of oats in North America is estimated at 1,615 million bushels, 7% less than in 1952. It is, however, 17% above the pre-war average. The bulk of the increase over the pre-war period is in the United States, where acreage is about 3.6 million acres larger than in 1935-39. In Canada, in contrast, the crop shows a moderate increase despite a 26% reduction in area. Canada's yields of 41.2 bushels per acre for the current season compare with a pre-war average of 25.5 bushels.

No significant change from the 1952 production of barley and oats is estimated for Europe, although both crops are estimated to be slightly larger than they were last year. In comparison with pre-war production, barley is up about 22%, but oats is about 13% smaller. Yields were generally above average in Western Europe, with record or near record yields reported for a number of countries. Outstanding exceptions to the large yields are apparent in the yields for Spain, reduced by dry weather, and the Netherlands, where barley was seeded on a considerable acreage of land flooded last February. The record barley acreage in that country is, however, largely a soil conditioning measure, with little or no grain crop expected in the areas that had been flooded. The harvest of these grains in Eastern Europe appears about the same as in 1952, with better yields than in 1952 for a number of countries offsetting reduced acreage.

Most recent information indicates that in the Soviet Union weather conditions during the latter part of the growing season were generally unfavourable to spring-sown grains. Since barley is predominantly and oats exclusively spring sown in the Union, yields of these grains are expected to be less than in 1952. Extensive rains during the harvest period, especially during late August, delayed harvesting in some regions, with increased crop losses probable.

Combined harvests of barley and oats in Asia appear slightly larger than last year, with a small increase for barley offsetting a slight decrease for oats. The total barley crop for the continent is estimated at 815 million bushels, compared with 800 million last year. The current estimate is about 6% above the pre-war average because of increased acreage. The oats crop is of minor importance in Asia, being estimated at 105 million bushels in 1953, compared with 110 million in 1952 and the pre-war average of 96 million bushels.

Not much change from the 1952 crop of these grains is expected for Africa. The barley estimate of 145 million bushels compares with 150 million last year and the pre-war average of 121 million bushels. Oats production is placed at 23 million bushels, the same as the pre-war average and very slightly below the 1952 crop of 24 million.

The outlook for crops in South America is generally favourable, though a repetition of last season's unprecedented harvest is not expected. The unusually large percentage of grain acreage allowed to mature as grain in Argentine was a large factor in accounting for that record crop. Latest reports from that important grain-producing country justify expectation of larger-than-average outturns, even though not up to the bumper 1952 harvest.

The barley crop in Australia may be slightly above the previous record crop of 38 million bushels harvested last year. Forecasts indicate that the barley acreage harvested next November-December may be considerably larger than the previous record acreage harvested last year. The crop is later than usual, but finishing rains in South Australia and Victoria could result in satisfactory yields. Oats production, in contrast with barley, is expected to be considerably less than the record crop harvested last season. In addition to reduced seedings, grazing of oats has been general because of shortages of other green feed. Yield prospects for areas being allowed to mature as grain have been greatly improved by recent rains in New South Wales and Queensland.

WORLD CROPS

VOLUME 5, 1953

INDEX

LEONARD HILL LIMITED · STRATFORD HOUSE
9 EDEN STREET · LONDON · N.W.1

WORLD CROPS INDEX

VOL. 5 • 1953

A

Accessories for the new Fordson Major (*fm*) 121
Achievements of EAAFRO (*ed*) . . 261
Aden cotton (*wcr*) 45
Adhesive latex 186
Advances
  in Agronomy (*br*) 211
  in Genetics (*br*) 470
Aerial Photography as an Aid in Planning Improved Land Use and Flood Control, *by R. Maclagan Gorrie, D.Sc.* . . 405
Aeroplane spraying 24
Aerosol
  application in the glasshouse (*fm*) . 123
  experiments in flour mill . . . 332
  fluids (*fm*) 167
Aerosurvey plan for Jordan . . . 452
Africa
  mealy buys in 73
  witchweeds of 263
African
  agricultural production 8
  plants for Australia 97
A.G.M. of Society of Chemical Industry (*ed*) 348
Agricultural
  advisory service in Venezuela . . 31
  aid by Britain 423
  crisis in Greece (*ed*) 304
  conditions in Sicily 417
  developments in Iraq 329
    in Italy 364
  engineering research in the U.K. . 163
  events, 1953 34
  exhibition of machinery in Paris . . 381
  Experiments in Greenland *by Marjorie Findlay* 457
  Legislation (*br*) 86
  machinery and rubber 199
    production in U.K. 30
  map of Great Britain 464
  mission from Canada 289
  Notebook, The (*br*) 504
  notes from Israel 444
  Planning in East Africa, *by A. C. Barnes, C.M.G.* 481
  Problems of the Niger Delta, *by C. H. Brown, B.Sc.* 273
  producers' federation 292
  production in Britain (*ed*) . . . 3
    in Sicily 417
  progress in Malaya (*ed*) . . . 172
  (Poisonous Substances) Act . . 184
  policy in Britain (*ed*) 132
  Possibilities of Morocco, *by C. H. Brown, B.Sc.* 98
  research in Colonies, 1951-52 . . 120
    in the Belgian Congo, *by W. G. Cass* 69
  returns for England and Wales . . 469
  Tractor, The (*br*) 118
Agriculture
  and education 270
  and electricity 288
  and nutrition in Indonesia. . . 451
  and the press (*ed*) 50
  in Eire (*ed*) 218
  in France (*ed*) 261
  in Papua and New Guinea. . . 17
  in South Korea 32
  in Taiwan, *by W. G. Cass* . . . 56
  in West Germany 335
  of the Sugar Cane, The (*br*) . . 427
Aircraft
  in Israeli Agriculture, *by J. Palti*. . 157
  spraying 110
Air-cooled engine (*fm*) 506
Air pollutant investigations (*res dev*) . 469
Alaskan farming conditions . . . 136

Editorial Comment (*ed*); Research Developments (*res dev*); New Books (*br*); World Crop Reports (*wcr*); Correspondence (*corr*); Farm Machinery (*fm*)

Aldrin
  advantages 277
  and Dieldrin 145
    Part I—*by L. W. Leyland Cole, M.Sc., B.Sc.(Agric.), F.R.I.C.* . 224
    Part II—*by J. I. Hendrie, M.A.* . 277
  as a soil insecticide 277
Aleppo pines in Morocco 142
Alkathene in agriculture 324
Amazon timber possibilities . . . 281
American
  farm produce barter scheme . . 140
  market garden 127
  Potato Yearbook 471
  Samoa and cocoa 396
  Tomato Yearbook, 1953 (*br*) . . 337
Amman Locust Conference 245
Analysis of Southern Rhodesian farms . 31
Anglo-Egyptian Sudan crop developments 244
Animal feeding and pastures. . . 103
Anniversary celebrations (*ed*). . . 345
Annual
  report of FAO 78
  reports received 40
  review of British farming (*ed*) . 305
Ant control. 279
Antihormone—maleic hydrazide (*res dev*) 76
Apple production progress in Italy. . 252
Arabian dates 340
Arable crops in New Zealand . . 316
Aramina fibre 54
Arctic circle farming 135
Areas under plantation rubber . . 175
Argentina, grain (*wcr*) 87
Argentine
  grain (*wcr*) 87, 257
  maize (*wcr*) 475
  1953 crops (*wcr*) 129
  wheat (*wcr*) 302
    crop (*wcr*) 387
Arid
  region vegetation 60
  zones, cultivation of 59
Artificial
  Grass Drying in the Netherlands, *by J. Grindrod* 331
  hay drying in Austria 423
Asian-Pacific Forestry Commission . 70
Atomic energy in plant science . . 450
Australia
  and African plants 97
  and harvesting flax crops . . . 375
  and the wheat pact 413
Australian
  developments 77
  farming notes . . 335, 370, 413, 459
  oats (*wcr*) 432
  rice production (*wcr*) 130
  tests of kenaf 112
  wheat (*wcr*) 130, 258, 301
    Crop, *by L. T. Sardone* 11
    harvest (*photographs*) 161
    harvesting 12
Australia's
  Tobacco Industry (*corr*) . . . 29
  tropical belt 228
  wheat crop for 1951-52 13
Austria and artificial hay drying . . 423
Austrian
  forest products laboratory . . . 332
  grain (*wcr*) 387
  wheat (*wcr*) 431
Autoblast conversion (*fm*) 83
Automatic baler (*fm*) 300

B

'Baby' tools at Smithfield Show, 1952 (*fm*) 28
Bacteria in legumes 104
Bale
  carrier (*fm*) 342
  loader (*fm*) 83
B.A.M.M.E.X. amalgamation . . 384
Banana
  disease in N.S.W. 67
  root borer control 279
Bangkok
  rice conference of FAO 251
    meeting (*ed*) 90
Bangweulu Swamps, The, *by Prof. Frank Debenham, M.C., O.B.E., M.A., D.Sc.* 150
Barley
  Crop, The (*br*) 39
  and oats production throughout the world (*wcr*) 508
Baskets and hurdles from willows . . 144
Bean crop in Mexico (*wcr*) . . . 507
Beef
  and corn production 381
  in New Zealand 315
Beet
  harvester (*fm*) 342
  sugar, conference on 162
    in Israel (*wcr*) 130
  thinning machine (*fm*) . . . 386
Belgian
  Congo and agricultural research . . 69
    crop developments 245
Belgium grain crop (*wcr*) . . . 387
Belladonna 65
Biological
  and chemical control. 35
  v. chemical control (*ed*) . . . 99
Black
  soils in Florida. 127
  wheat beetle control in Kenya . . 279
Blackpool Royal Show preparations . 41
Bokaro project 308
Brazil
  and oiticica (*wcr*) 387
  and rubber (*ed*) 1
Brazilian carnauba wax (*wcr*). . . 129
Brazil's
  intensive wheat production campaign (*wcr*) 169
  rubber and jute increases . . . 158
Britain and New Zealand 317
Britain's
  Food Supplies (*br*) 39
  milk problems (*ed*) 48
British
  agricultural aid 423
    production (*ed*) 3
  Commonwealth cotton prices . . 371
  Crop Production Products Approval Scheme 339
  diesel tractors (*ed*) 436
  farming, annual review 305
  forestry demonstration 333
  forests, present and past (*ed*) . . 92
  Grasslands (*br*) 295
  Guiana and the rice industry . . 280
    jute investigation 166
    rice production (*wcr*) . . . 170
    sugar crop (*wcr*) 179
  Honduras, rami (*wcr*) 216
national weed control conference . 384
research and development organisations 181
'rice field' demonstration . . . 334
top-dressing operations 422

Britain *v.* the Colorado beetle (*ed*) . . 391
Broomcorn Production . . . 460
Brush clearing mechanised . . . 286
Bulletins and Reports 128
Bunchy Top
  Disease of Bananas in N.S.W., *by H. J. Cann, H.D.A.* 67
  results obtained 68
Burma, cotton forecast (*wcr*) . . . 170
Burma's rice crop (*ed*) . . . 346
B.W.I. sugar (*wcr*) . . . 87, 475

C

Cable controls 404
Cabma register 425
Cacao, world forecast (*wcr*) . . . 129
Californian redwood 25
Canada, tobacco in (*wcr*) . . . 88
Canadian
  agricultural mission 289
  crops (*wcr*) 432
  flaxseed (*wcr*) 507
  forestry 359
  irrigation schemes 138
  sugar beet outlook (*wcr*) . . . 169
  vegetable oil (*ed*) 348
Cane Sugar in East Africa, *by A. C. Barnes, C.M.G.* 355
Capsids and cocoa (*ed*) 433
Cardaria Draba
  —A Globe-trotting Weed, *by S. J. Willis, B.Sc.(Agric.)* . . . 310
  control 311
Carnauba wax in Brazil (*wcr*) . . 129
Cart and horse in Russia (*ed*) . . 435
Caterpillar
  new manufacturing plant . . . 408
  plant 338
    manager 367
  tool bar (*fm*) 386
Cattle awards at Smithfield Show, 1952 . 26
CDAA, new plant hormone . . . 127
Celery soils in Florida 127
Cement from latex 186
Central
  plateaux of Morocco 98
  Tractor Organisation of India . . 16
Cereal seed 115
Ceylonese land reclamation . . . 31
Changes in the Fertiliser Industry of the United States, *by Harry A. Curtis* . 105
Chelsea Show, The 293
Chemical
  and biological control . . . 35
  control of witchweeds . . . 265
  pest control economy . . . 368
  v. biological control (*ed*) . . . 90
Chile and FAO forestry mission . . 81
Chinese
  crop prospects (*wcr*) 387
  rhubarb 66
  rice (*wcr*) 343
Christmas acknowledgments . . . 85
Churchill on British agriculture (*ed*) . 132
Cider Factory, Plant and Layout, The (*br*) 470
Citrus
  crop nutrition 153
  cultivation in Egypt 442
  exports, Israel (*wcr*) 170
  fruit in Europe (*wcr*) 476
    in North America (*wcr*) . . . 476
    in South America . . . 290, 398
    world production (*wcr*) . . . 476
  industry in Cyprus (*wcr*) . . . 169
Classification of colonial territories . . 241
Clifford Aero and Auto Ltd., change of address 448
Clove
  Industry in Zanzibar and Pemba, *by R. O. Williams, O.B.E., and A. K. Briant, M.A., Dip.Agric.(Cantab.), A.I.C.T.A.* 414
  research in Zanzibar (*ed*) . . . 261
  substitute production, Indonesia (*wcr*) . 170
Coastal flooding committee . . . 253
Cockchafer larvae control . . . 278
Cocoa
  and American Samoa . . . 396
  and capsids (*ed*) 433
  and Cook Islands 397
  and Fiji Islands 397
  and the Gold Coast (*ed*) . . . 2
  and New Caledonia 395
  and New Guinea 394
  and New Hebrides 395
  and Solomon Islands 395
  and South Pacific Commission (*ed*) . 48
  and swollen shoot disease in Gold Coast (*ed*) 389
  and Western Samoa . . . 97, 395
  and witches' broom disease (*ed*) . 390, 399
  conference (*ed*) 433
    of 1953 449
  expedition (*ed*) 90
  in the South Pacific . . . 124, 393
  in Papua 394
  production in West Pacific (*ed*) . . 48
  threats in West Africa (*ed*) . . . 389
Coconut
  Industry of Seychelles, The, *by F. Durocher-Yvon, M.B.E., Dip.Agric. (Maur.)* 437
  survey and South Pacific Commission . 16
Coffee
  and P.L.A. 491
  and South Pacific 124
  and tea rival (*ed*) 304
  deficiencies in Costa Rica . . . 455
  in India (*wcr*) 88
  mealy bug in East Africa . . . 74
Cold climate crops 135
Colston
  symposium (*ed*) 174
    on Insecticides and Colonial Agricultural Development . . . 248
Colombo
  plan 452
    students' course 463
    subsidiary (*ed*) 47
    trainees' visit 252
Colonial
  agricultural research, 1951-52 . . 120
  Development Corporation (*ed*) . . 259
  directors of agriculture conference (*ed*) 434
  insect pests (*ed*) 219
  Territories (*br*) 86
    classification 241
Colorado beetle in Britain (*ed*) . . 391
Combine
  attachments (*fm*) 342
  harvesters, small (*fm*) . . . 27
Coming events 34
Committee for coast flooding . . 253
Common Farm Weeds Illustrated (*br*) . 39
Commonwealth
  Bureau address change . . . 428
  food plans 41
Community projects in India (*ed*) . . 89
Compressor leaflet (*fm*) . . . 473
Concentrated
  latex 187
  superphosphate in U.S.A. . . . 106
Conference
  at Noumea 223
  of colonial directors of agriculture (*ed*) 434, 462
  of sugar (*ed*) 305
  on Indonesian rubber . . . 193
Conferences and lectures . . . 35
Congo Jute and its Potentialities, *by A. E. Haarer, F.L.S.* 54
Consumption
  and production research in rubber . 183
  of rubber 178
Contact insecticides 24
Continuous Cloches for Early Crops, *by J. L. H. Chase* 494
Control
  of ants 279
  of Banana root borer 279
  of black wheat beetle in Kenya . . 279
  of Cardaria Draba 311
  of cockchafer larvae 278
  of flies and mosquitoes . . . 225
  of insect pests by thermal fog . . 409
  of locusts 225
  of olive fly (*ed*) 218
  of Red Spider Mite 501
  of sweet potato weevil . . . 279
  of the spruce budworm, the . . 363
  of witches' broom disease . . . 399
Controlling the grey squirrel (*ed*) . . 4
Conversions of Fordson Major (*fm*) . 212
Cook Islands and cocoa . . . 397
Co-operation
  and Integration in Oil Palm Research, *by S. de Blank, B.Sc.* . . . 221
  in South Korea 34
Co-operative farms in Hungary . . 128
Copra
  and Seychelles 440
  in Fiji (*wcr*) 216
  in the South Pacific 124
Cork oaks in Morocco 141
Corn and beef production . . . 381
Costa Rica and coffee 455
Cotton
  acreage estimate, India (*wcr*) . . 170
  and cottonseed in India (*ed*) . . 392
  and mechanical picking . . . 326
  and the world (*wcr*) . . . 388
  crop in Pakistan (*wcr*) . . . 216
    in Queensland 325
  exports, Egypt (*wcr*) 170
  forecast, Burma (*wcr*) . . . 170
  in Aden (*wcr*) 45
  in Guatemala (*wcr*) 301
  in India 289
  in Iran (*wcr*) 343
  in Morocco 99
  in Pakistan (*wcr*) . . . 302, 475
  in Southern Rhodesia . . . 152
  in Turkey (*wcr*) 257
  in Uganda (*wcr*) . . . 301, 475
  in U.S.A. (*wcr*) . . . 257, 476
  pest control experiments . . . 41
  pests in the Sudan 72
  problems in Niger Delta . . . 274
  production in the British Commonwealth 371
  reports of the E.C.G.C. . . . 142
  trade in Australia 77
Cottonseed
  in U.S.A. (*wcr*) 301
County show exhibits of Ministry of Agriculture 421
Creaming latex 187
Cricket bat willows 145
Crop
  development in French Equatorial Africa 245
  in the Anglo-Egyptian Sudan . . 244
  developments in the Belgian Congo . 245
  production programme in India . . 289
  prospects in China (*wcr*) . . . 387
  in South Africa . 290, 380, 398, 464
  protection approval scheme . . 330
Cropping in saline soils (*ed*) . . . 347
Crops
  in Canada (*wcr*) 432
  in England and Wales (*wcr*) . . 216
  in Spain (*wcr*) 431
  in Queensland 370
Cuban sugar (*wcr*) 432
Cultivation
  of Arid Zones, *by Eric Hardy, F.Z.S.* . 59
  of kenaf 51
  of rice in Egypt, the 146
Cultural control of witchweeds . . 264
Cuttack Rice Research Institute . . 112
Cyprus citrus industry (*wcr*) . . . 169

D

Dairy cattle in New Zealand . . . 315
Damascus locust meeting . . . 505
Damming the Ord River Valley . . 230
Damodar Valley
  Project, The, *by S. Ramanath* . . 307
  scheme, bank loan 166
Danube Delta and rice cultivation . . 285
Date production in Pakistan . . . 358
Daylight and milk production . . 136
DDT factory for Delhi (*fm*) . . . 84
Decontrol of feeding stuffs in Britain (*ed*) 91
Decortication of kenaf 52

Degeneration of South African Citrus Clones, *by Prof. P. C. J. Oberholzer* . 420
Delhi DDT factory (*fm*) . . . 84
Demands for latex 186
Demonstration of machinery at Fernhurst 379
Denmark to have tractors (*fm*) . . 84
Department of Agriculture, Zanzibar, report 40
Depth control unit (*fm*) . . . 473
Desalting brackish water (*ed*) . . 220
Desert locust plague 377
Deserts of Western Asia . . . 60
Destruction caused by the North Sea floods 209
Development
and publicity of rubber . . . 184
of Citrus Cultivation in Egypt, The, *by Charles P. Brown, D.Sc.*. . . 442
of crops in Indonesia . . . 244
of new uses in rubber . . . 184
projects in Pakistan 320
and progress of irrigation in the Union of South Africa 232
Developments
in Drift Spraying, *by R. J. Courshee, B.Sc.* 109
in oil palm 221
in potash (*ed*) 392
Devising Systems of Permanent Agriculture in Southern Rhodesia, *by J. W. Rowland* 349
Dieldrin
and Aldrin 224, 277
as a wall spray 226
Diesel
popularity growing (*fm*) . . . 122
power (*fm*) 27
tractors in Britain (*ed*) . . . 436
Diploma presentations 123
Directors of agriculture conference (*ed*) 434, 462
Disc plough award (*fm*) . . . 214
Disinfestation of Ships' Holds . . 499
Dormancy in barley 116
Draft sugar agreement (*ed*) . . . 435
Drainage requirements in Niger Delta . 275
Drift
sprayers, land based 109
spraying mathematics . . . 110
Dron-Wal knapsack sprayer (*fm*) . . 43
Drought in the Southern U.S.A. (*ed*) . 390
Drug Plant Cultivation in the Netherlands, *by K. J. H. van Sluis* . . . 65
Dry rubber and latex 187
Drying herbal plants 66
Dugdale, Sir Thomas (*ed*) . . . 132
Dutch
agricultural developments in tropics . 331
flood disaster 116
herbs 65
research on the mechanical and chemical control of Imperata grass . . 287

E

EAAFRO achievements (*ed*) . . . 261
East
Africa and cane sugar . . . 355
and Mau Mau (*ed*) . . . 217
African agricultural planning . . 481
agricultural research . . . 120
coffee mealy bug 74
future (*ed*) 217
and Hevea 194
China, 1952 harvest (*wcr*) . . . 87
European and U.S.S.R. agricultural production 7
E.C.E. timber committee . . . 94
E.C.G.C. progress reports . . . 193
Ecological relationships in legumes . 102
Economic
difficulties of rubber 191
use of fertilisers 402
Economics
in agriculture in U.K. (*ed*). . . 173
on the farm in U.K. (*ed*) . . . 173
Economy of Chemical Pest Control, The, *by R. J. Courshee, B.Sc.* . . . 368
Education in Tropical Agriculture, *by C. W. L. Fishlock, B.Sc., A.I.C.T.A.* . 270
Eelworms and electricity (*ed*) . . 134
Effects of Organo-Mercurial Fungicides on Sugar Cane Cuttings . . . 497
Egypt
and citrus cultivation . . . 442
cotton exports (*wcr*) 170
rice cultivation in 146
Egyptian wheat (*wcr*) 431
Eire agriculture (*ed*) 218
El Problema Mundial del Azucar (*br*) . 504
Electric
fencing for pigs (*fm*) 473
in Scotland (*fm*) 122
Electrical
grain blower (*fm*) 341
Electricity
and agriculture 288
and eelworms (*ed*) 134
Elements, confusion in nomenclature (*ed*) 50
Elm
leaf beetle control in New York . . 411
in Paris 411
Empire
and Commonwealth Year Book 1953-54, The (*br*) 504
Cotton Growing Corporation reports . 142
Engineering research, agricultural . . 163
England
and land reclamation . . . 382
and Wales, agricultural returns (*wcr*) . 45
crops, 1952 (*wcr*) 216
fruit and vegetables (*wcr*) . . 45
English
approved seed peas 498
crop protection 461
farmers' meeting 496
E.N.I.T. 86
Entoma (*br*) 254
Estate output in Indonesia (*wcr*) . . 507
Eucalyptus imports to Morocco . . 141
European
citrus crops (*wcr*) 476
farm radio conference . . . 505
floods (*ed*) 89
hybrid maize 231
rice crop (*wcr*) 87
Expedition for new cocoa types (*ed*) . 90
Experiment station in Malaya . . 189
Experimental
farms (*ed*) 4
rice crops in Australia . . . 370
Export crops plantation production . 243

F

Fabrics and fumigation (*ed*) . . . 260
FAO
and forage seeds 198
and hot springs (*ed*) 346
and land tenure reform (*ed*) . . 2
and rice (*ed*) 47
and timber 93
council (*ed*) 347
meeting, November 1952 . . 79
forestry mission for Chile . . . 81
plant breeders' list 287
publications 211, 338
reports and publications . . . 296
rice conference. 251
wheat conference 382
work during 1951-52 . . . 78
Far Eastern
agricultural production . . . 9
research 120
Farm
adoption scheme (*ed*) . . . 477
demonstration by I.C.I. . . . 384
diesel engine (*fm*) 429
economics in U.K. (*ed*) . . . 173
flooded (*ed*) 172
Glossary (*br*) 337
income and fertilisers . . . 404
Incomes in England and Wales (*br*) . 160
Machinery (*br*). 39
Power (*br*) 119
Workshop, The (*br*) 254
Farming
in Australia 335
in Greenland 457
in New Zealand 313
notes from Australia . . 370, 413, 459
review in Britain (*ed*) 305
Within the Arctic Circle, *by Frank Illingworth* 135
Farms for experiments (*ed*) . . . 4
Federation of agricultural producers . 292
Feedingstuffs
de-controlled in Britain (*ed*) . . 91
production from green crops . . 64
Ferguson
Company in France (*fm*) . . . 122
track conversion (*fm*) . . . 43
tractor exports (*fm*) 44
Fernhurst
Lecture on plant hormones . . 125
machinery demonstration centre . . 379
Fertiliser
demonstrations in U.K. . . . 227
plants in the U.S.A. 106
prices in Southern Rhodesia . . 227
production and consumption throughout the world (*ed*) 306
Technology and Resources in the United States (*br*) 427
Fertilisers
and farm income 404
and fruits 404
and milk 403
for citrus. 154
in Economic Use, *by D. P. Hopkins, B.Sc., F.R.I.C.* 402
in India 289
in Israel 75
in South America (*ed*) . . . 478
Fertiliser-insecticide mixtures (*ed*). . 433
Fiat 35 (*fm*) 83
Fibres—natural and synthetic . . 40
Field harvester (*fm*) 255
Fiji
and horticultural tractors . . . 283
copra (*wcr*) 216
Islands and cocoa 397
tractor trials (*corr*) 424
Flax
and the world (*wcr*) 258
breeding in Australia . . . 77
crop harvesting in Australia . . 375
Flaxseed
in Canada (*wcr*) 507
in U.S.A. (*wcr*) . . . 343, 507
Flood
destruction by the North Sea . . 209
disaster in Britain (*ed*) . . . 131
in Holland (*ed*) . . . 116, 131
relief aid 168
Flooded farm (*ed*) 172
Floods
after the (*ed*) 172
in the Low Countries (*ed*) . . . 131
Florida
and lawn pest control . . . 461
and vegetables 127
citrus investigations 153
Flowering Plants of the Anglo-Egyptian Sudan (*br*) 118
Fly and mosquito control . . . 225
Fog
generator operated by jet (*fm*) . . 122
generators 409
Food
and Agricultural Council in Pakistan . 362
and the future (*ed*) 303
consumption throughout the world . 5
production in Hong Kong (*ed*) . . 92
schemes for Pakistan. 463
Fodder, mechanical dehydration of . 337
Foliar
nutrients 24
spraying for the application of plant nutrients to crops (*res dev*) . . 503
Forage seeds and FAO. 198
Fordson
demonstrations in Holland (*fm*) . . 43
Major accessories (*fm*) . . . 121
conversions (*fm*) 212
P.T.O. (*fm*) 473

Foreign trade and Pakistan . . . 292
Forestry
and Californian redwood . . . 25
demonstration in Britain . . . 333
in Canada, *by John Grindrod, B.A.* . 359
in Great Britain 284
in Morocco 141
policy in Uganda (*corr*) . . . 206
Forests in Britain (*ed*) 92
Foxglove 66
France
and Ferguson Co. (*fm*) . . . 122
grain (*wcr*) 475
areas (*wcr*) 170
soil improvement research in (*res dev*) . 165
Freedom for fertilisers (*ed*) . . . 392
French
agriculture (*ed*) 261
agricultural machinery exhibition . 381
equatorial African crop developments . 245
exploitation of Jerusalem artichoke (*res dev*) 253
Friesians again triumphant (*ed*) . . 480
Front-end Loaders in Agriculture, *by Frank Foster* 30
Fruit
and vegetables in England and Wales (*wcr*) 45
Annual, 1952-53, The (*br*) . . . 118
drop, prevention of 126
futures in South Africa . . . 180
in South Africa 380
news from South Africa . . . 150
research in South Africa . . . 73
Fruits and fertilisers 404
Fumigation and fabrics (*ed*) . . . 260
Future
of East Africa (*ed*) 217
of food, the (*ed*) 303
of fruit in South Africa . . . 180
of latex 188
400 Plants of South Florida (*br*) . . 337

G

G.A.J.'s tour of floods 172
Gambia rice project (*ed*) . . . 259
Garden party at Hampshire . . . 424
Genetic mutations of seeds . . . 114
German
control of nun moth 411
grain (*wcr*) 432
Ginning of cotton 327
Glasshouse crops research institute . 374
Glasshouses and aerosol application (*fm*). 123
Gold Coast
agriculture mechanised . . . 108
and swollen shoot of cocoa (*ed*) . . 389
cocoa (*ed*) 2
tour by Mr. E. N. Griffith. . . 168
Gorse burning 504
Grading of cotton 327
Grain
and fertiliser drill (*fm*) . . . 430
and P.L.A. 490
areas, France (*wcr*) 170
crops in U.S.A. 343
1952 (*br*) 210
drying, storage and handling training course 465, 505
in Argentina (*wcr*) 87, 257
in Austria (*wcr*) 387
in Belgium (*wcr*) 387
in France (*wcr*) 475
in Germany (*wcr*) 432
in India (*wcr*) 257
in U.S.S.R. (*wcr*) 387
in Yugoslavia (*wcr*) 431
Sorghums, The (*br*) 40
Grapes in South Africa 380
Grass
leys in Southern Rhodesia . . . 471
mixtures 116
suppressive (*res dev*) 76
Grassland cleared by tractors (*fm*) . . 214
Great Britain and forestry . . . 284
Greece, tobacco (*wcr*) 87
Green crops and protein extraction . 63
Greenland
farming 457
haymaking 458
Greenland's Experiment in Agriculture, *by Marjorie Findlay* 457
Green Manuring
in India and Pakistan, *by Dr. C. de Fellner* 318
in India and Pakistan 503
Greek
agricultural crisis (*ed*) . . . 304
land reclamation 291
Grey squirrel (*ed*) 4
Griffith's, E. N., Gold Coast tour . . 168
Ground machine spraying . . . 110
Guatemala cotton (*wcr*) . . . 301
Guild of Agricultural Journalists (*ed*) . 50
Gun-type nozzle (*fm*) 122
Gypsy moth control in U.S.A. . . 410

H

Haifa fertiliser plant 75
Halogeton control 64
Hammer mill for David Brown tractor (*fm*) 43
Hampshire garden party . . . 424
Hand pollination of Hevea . . . 196
Handbook of Agricultural Chemicals (*br*) 210
Handling silage (*fm*) 28
Harvest
in East China (*wcr*) 87
prospects in Hungary (*wcr*) . . 475
Harvesting Flax Crops in Australia, *by W. L. Greenhill, M.E.* . . . 375
Hashish and hemp (*ed*) 49
Hawaiian
pineapple industry 126
sugar cane harvester (*fm*) . . . 42
Hay
baler 341
drying artificially in Austria . . 423
rake (*fm*) 386
Haymaking in Greenland . . . 458
Health hazards in crop protection . . 36
Heavy duty loader 30
Hemp
and hashish (*ed*) 49
and U.S.A. 446
(Cannabis Sativa), *by A. E. Haarer, F.L.S.* 445
retting 448
seed 447
uses 446
varieties 446
Henbane 66
Herbs in Holland 65
Herklots, Dr. G. A. C. 168
Hevea, Improvement of Yields . . . 196
High-pressure sprayer (*fm*) . . . 255
High-speed diesel (*fm*) 300
Hong Kong food production (*ed*) . . 92
Hormone weedkiller 266
Hormones in plants 125
Horse and cart in Russia (*ed*) . . 435
Horticultural tractors and Fiji . . 283
Hot springs and FAO (*ed*) . . . 346
Hungarian
co-operative farms 128
potatoes (*wcr*) 257
Hungary
harvest prospects (*wcr*) . . . 475
rice (*wcr*) 302
Hyacinth in water (*ed*) 172
Hybrid
maize in Europe 231
in South Africa . . . 380, 454
meeting 503
Hydraulic
lift for tractor (*fm*) 213
lifts in tractors 207
loaders 30

I

I.B.A.E. paper on N.I.A.E. . . . 163
I.C.I. farm demonstration . . . 384
I.C.T.A., new principal . . . 168
Imperata grass control . . . 287, 441
Importance of the oil palm . . . 221
Improved planting material for rubber . 176
Improvement of Yields in Hevea Brasiliensis, *by E. D. C. Baptist, Ph.D.(Lond.), M.Sc., A.R.C.S., D.I.C.* . . . 194
Impurities in seed stock . . . 113
Increase of rubber (*ed*) 171
India
and green manuring 318
and mechanisation (*ed*) . . . 478
cotton estimate (*wcr*) 170
studies fertiliser production . . 140
Indian
coffee (*wcr*) 88
community projects (*ed*) . . . 89
cotton 289
and cottonseed (*ed*) . . . 392
crop production programme . . 289
fertilisers 289
grain (*wcr*) 257
irrigation 15, 289
jute (*wcr*) 289, 301
Research Institute 293
oilseed (*wcr*) 343
Plant Protection (*br*) 254
pump manufacture 15
sugar (*wcr*) 289, 431
factory 421
Tea Association, 1951 . . . 40
propaganda 448
Virginian-type tobacco (*wcr*) . . 130
wheat (*wcr*) 387
Indonesian
agriculture 451
clove substitute production (*wcr*) . 170
crop development 244
estate output (*wcr*) 507
nutrition 451
rice production 82
Rubber Conference 193
sugar production (*wcr*) . . . 170
Industry's Contribution to Agricultural Research 21, 71, 113
I.N.E.A.C. report 69
Influence of Introduced Crops on Colonial Economies, *by Sir Harold Tempany, C.M.G., C.B.E., D.Sc., F.R.I.C.* . 241
Insect
pest control in forests and plantations by thermal fog 409
pests in the Colonies (*ed*) . . . 219
Insecticidal
aerosols 468
—author's name 384
in flour mill premises . . . 332
and colonial agricultural development symposium at Colston . . . 248
residues on vegetables (*ed*) . . . 262
Insecticides and predators (*ed*) . . 479
International
Agricultural Fair 286
conference 428
exhibition of agriculture in Rome 461, 502
Exhibition and Congress at Parma . 502
Organisation of Research and Development in the Natural Rubber Industry, *by Geoffrey Gee, Sc.D., F.R.S.* . 181
pulpwood trade 96
Sugar Conference (*ed*) . . 305, 378
wheat agreement (*ed*) 217
council (*ed*) 47
Investigations
in Citrus Production, *by F. C. Darcel* . 153
on the production of jute in the British Colonies 276
Iran cotton crop (*wcr*) 343
Iraq and agricultural developments . 329
Irish
milling order 293
tillage acreage 286
Irrigation
development and progress in South Africa 232
of Morocco 98
in India 15, 289
of rice in Egypt 147
project in the U.S.S.R. . . . 18
schemes in Western Canada . . 138

Israel
(*wcr*) 45
and safflower growing . . . 266
and summer rye varieties . . . 453
citrus exports (*wcr*) 170
plans self-sufficiency in fertilisers . 75
Israeli
agricultural expansion . . . 108
farming notes 236, 444
olive crop (*wcr*) 344
sugar beet (*wcr*) 130
Israeli's agricultural aircraft . . . 157
Italian
agricultural developments . . . 364
apple production progress . . . 252
machinery developments . . . 364
vegetable seed oil (*wcr*) . . . 387

J

Japanese
beetle control in Maryland . . 411
rice (*wcr*) 46
sugar beet (*wcr*) 216
Java, rice (*wcr*) 216
Jealott's
Hill Research Station (*ed*) . . . 345
Hill's silver jubilee 383
Jerusalem artichoke (*res dev*) . . . 253
Jet-operated fog generator (*fm*) . . 122
Jordan aerosurvey plan. . . . 452
Jungle menace 433
Jute
crop (*corr*) 424
in India (*wcr*) 289, 301
in Pakistan (*wcr*) 343
investigations in British Guiana . . 166
prices (*corr*) 82
production investigations in British Colonies 276
research institute in India . . . 293
shortage 51
substitute 54
supplies (*corr*) 206
trials in British Colonies . . . 276

K

Kenaf
in Mauritius, *by Serge Staub and E. Limfat* 51
in Nigeria 276
tests in Australia 112
Kenya, control of black wheat beetle . 279
Kimberley Division prospects of rice . 229
Knapsack sprayer (*fm*) 214
Konar dam. 307
Korean agriculture 32
Krilium
(*ed*) 132, 466
news (*ed*) 303

L

Laboratory in Austria for forest research. 332
Land
based drift sprayers 109
development scheme in Mokwa . . 202
developments in arid zones . . 61
reclamation in Ceylon . . . 31
in England 382
in Greece 291
reform in Taiwan 58
in South Korea 33
tenure among primitive people (*ed*) . 134
reform and FAO (*ed*) . . . 2
Latex
and dry rubber 187
and rubber 185
and the future 188
as a raw material 185
as an adhesive 186
cement 186
concentrated 187
creaming 187
demands 186
preparation 186
sponge 186
Latin-American
agricultural production . . . 8
seminar 334
Lawn pest control in Florida. . . . 461
Leaf protein (*ed*) 436
Legumes
and soil 102
in Tropical Agriculture, *by R. O. Whyte, Ph.D., B.Sc.*. 101
Lelydorp Plan (*corr*) 82
Leonard Hill Ltd. 444
Leverhulme Memorial lecture . . 240
Light sets for tractors (*fm*) . . . 300
Livestock
and molybdenum 269
in Sicily 418
Lime and molybdenum . . . 268
Liquid manure spreader (*fm*) . . 167
List of Sugar-Cane Insects (*br*) . . 471
Lobelia 66
Locust
conference at Amman . . . 245
control 225
plague in the desert 377
research and control in the Colonies . 120
theory 77
Long Ashton research station (*ed*) . . 345
Low
Countries, floods in (*ed*) . . . 131
volume spraying in the orchard . . 416
Lucerne breeding 116

M

Macaulay Institute for Soil Research . 80
Machinery
at the Royal Show (*fm*) . . . 298
demonstration centre at Fernhurst . 379
developments in Italy . . . 364
show in Paris 215
Macmillan, Major D. M. . . . 223
Madagascar spice (*wcr*) . . . 216
Magnesium Ein Pflanzennahrstoff (*br*) . 86
Maithon dam 307
Maize
in Argentina (*wcr*) 475
in Mexico (*wcr*) 387
in South Africa 290, 398
self-sufficiency in South Africa (*wcr*) . 169
throughout the world (*wcr*) . . 302
Malaya mechanises (*fm*) . . . 122
Malayan
agricultural progress (*ed*) . . . 172
experiment station 189
investigations into the mechanised cultivation of padi 119
research institute 189
rice (*wcr*) 46
rural development 465
tractor training (*corr*) . . . 207
Maleic hydrazide (*res dev*) . . . 76
Manufacture of sytam (*res dev*) . . 117
Manufactured rubber 200
Manure spreader (*fm*) 386
Marginal
Land in Britain (*br*) 159
production scheme revised. . . 382
Marigold 66
Market gardens in America . . . 127
Marketing wheat in Australia . . 14
Marshmallow 65
Maryland and Japanese beetle control . 411
Massey-Harris
Annual (*br*). 295
change (*fm*) 84
Mate—a rival to tea and coffee? (*ed*) . 304
Materiae Vegetabiles (*br*) . . . 295
Mau Mau in East Africa (*ed*) . . 217
Mauritius
and sugar cane varieties (*ed*) . . 219
kenaf in 51
sugar (*wcr*) 475
Mealy bugs in Africa 73
Mechanical
dehydration of fodder . . . 337
picking of cotton 326
stonepicker (*fm*) 506
Mechanisation
and yields (*ed*) 346
in India (*ed*) 478
of Agriculture in India, *by John Grindrod, B.A.(Com.)* 15
Mechanised
Agriculture in Fiji, *by R. R. Mason, B.Sc., N.D.A., Dip. Agric.(Cantab.)* 282
brush clearing 286
cultivation of padi investigation . . 119
rice growing in Fiji 283
Meeting
of sugar-cane technologists . . 463
of Superphosphate Association . . 377
Mexican wheat (*wcr*) 387
maize (*wcr*) 387
Microsol
demonstration (*fm*) 84
director's tour 334
Milfoil 65
Milk
and fertilisers 403
per acre (*ed*) 48
problems in Britain (*ed*) . . . 48
Milking
and teat cups (*res dev*) . . . 117
machine development (*res dev*) . . 117
Mimosa, thornless (*res dev*) . . . 37
Mineral
and soil organic weathering (*res dev*) . 336
elements and citrus 156
Mineralisation of organic nitrogen in soils (*res dev*) 253
Ministry
of Agriculture exhibits . . . 297
of Agriculture's county shows . . 421
Minor Element Deficiencies in Coffee in Costa Rica, *by Dr. Harold Mowry* . 455
Mobile workshop for Rhodesia (*fm*) . 473
Mokwa scheme 202
Molybdenum
and lime 268
and livestock 269
on New Zealand Pastures, *by T. W. Walker, B.Sc., Ph.D., A.R.C.S.* . 267
Moroccan
central plateaux 98
irrigation development . . . 98
plains 98
Morocco, tree growing and forestry in . 141
Morris van (*fm*) 341
Mosquito and fly control . . . 225
Mower, semi-mounted (*fm*) . . . 255
Muck loader (*fm*) 430
Mystery disease unveiled? (*ed*) . . 348

N

N.A.A.S. experimental farms (*ed*) . . 4
National
Farmers' Union (*ed*) . . . 132
Institute of Agricultural Botany . . 284
Institute of Agricultural Engineering, paper on 163
weed conference 309
Natal sugar cane crop (*wcr*) . . . 46
Near Eastern agricultural production . 9
Nebraska tractor tests 36
Negev vegetation 61
Netherlands
and artificial grass drying . . . 331
and drug plant cultivation . . . 65
wheat (*wcr*) 432
New
Caledonia and cocoa . . . 395
England crops 127
Guinea agriculture 17
and cocoa 394
quarantine office in . . . 70
rice cultivation 17
tea 413
Hebrides and cocoa 395
method of propagation by cuttings (*res dev*) 208
South Wales and bunchy top disease of bananas 67
pasture research 472
Year Honours 85
York and control of elm leaf beetles . 411

Zealand and Britain 317
arable crops 316
beef 315
dairy cattle 315
Farming, *by D. S. Hendrie, B.Sc.(Agric.), B.Sc.(Est. Man.), N.D.A., N.D.D.* 313
farm output 150
pastures and molybdenum . . 267
pastures and top dressing (*res dev*) . 37
sheep 315
News of krilium (*ed*) 303
Newsprint 96
Newton Abbott potato conference (*ed*) . 220
N.I.A.B. 114
N.I.A.E. tractor tests 36
Niger Delta
agricultural problems . . . 273
and cotton problems 274
and drainage requirements . . 275
and pests 275
and rice cultivation problems . 273
Nigeria and kenaf 276
Nigerian
land development scheme . . 202
Palm Oil Ordinance (1935) . . 67
' Nitraphosphate ' processes in the U.S.A. 107
1949 timber conference . . . 94
Nodule infection by bacteria . . . 101
North
America's main producing regions . 6
citrus fruits (*wcr*) 476
Australian rice 228
Sea flood destruction . . . 209
Sumatra rice production (*wcr*) . . 129
Notes on Animal Health and Industry for Africans (*br*) 470
Nun moth control in Germany . . 411
Nutrient assimilation (*ed*) . . . 91
Nutrition and Agriculture in Indonesia, *by John Grindrod, B.A.(Com.)* . . 451

O

Oats
and barley production throughout the world (*wcr*) 508
in Australia (*wcr*) 432
Oceania, agricultural production . . 10
OEEC
grassland team visit 312
training course 465
Official exhibits at the Royal Show . . 365
Oil
palm developments 221
experiments 69
importance 221
research co-operation and integration 221
Oilseed
in India (*wcr*) 343
in Sweden (*wcr*) 88
Oil-type clutch (*fm*) 429
Oiticica in Brazil (*wcr*) 387
Oliver crawler (*fm*) 43
Olive
crop in Israel (*wcr*) 344
fly control (*ed*) 218
oil in Tunisia (*wcr*) 257
Open day of E.R.A. 288
Orchard fruit sprayer demonstration (*fm*) 83
Orchards and low volume spraying . 416
Ord River Valley dam 230
Organic
nitrogen mineralised in soils (*res dev*) . 253
weathering of minerals and soils (*res dev*) 336
Overseas
Food Corporation (*ed*) . . . 89
Queensland-British (*ed*) . . . 133
Owen Organisation in Canada . . 428

P

Paka 54
Pakistan
and date production 358
and green manuring 318
cotton (*wcr*) . . . 216, 302, 475
cultivation 290
fertiliser plant 493
Food and Agricultural Council . . 362
jute (*wcr*) 343
rice (*wcr*) 301
crop (*wcr*) 344
wheat imports 128
shortage 297
Pakistani
development projects . . . 320
food schemes 463
Pakistan's foreign trade . . . 292
Palm Oil Ordinance (1935) . . . 67
Panchet Hill project 308
Papua
agriculture in 17
and cocoa 394
Paraguay sugar (*wcr*) 130
Paris
and control of elm leaf beetles . . 411
machinery show 215
Pasture research in New South Wales . 472
Pastures and animal feeding . . . 103
Peasant production of export crops . 243
Pea stocks improved 31
Pemba and Zanzibar clove industry . 414
Perspex in agriculture 324
Pest
and disease control in Taiwan . . 57
control economy 368
control in the Sudan 456
Ltd. and systemic insecticides . . 22
in Britain, Part I, *by W. E. Ripper, Ph.D., F.R.E.S.* 21
visited by Colombo plan trainees . 252
infestation research in 1952 (*res dev*) . 425
Pesticide hazards (*ed*) 434
Pests
and diseases in Seychelles . . . 441
and Niger Delta 275
Phenoxylene milestone reached . . 297
Philippines, rice in (*wcr*) . . . 301
Philippino rice (*wcr*) 45
Phosphorus production in the U.S.A. . 107
Pick-up baler (*fm*) 255
Pigs and electric fencing (*fm*) . . 473
Pineapple
and the world (*wcr*) 258
industry of Hawaii 126
Plague of desert locusts . . . 377
Plain words (*corr*) 206
Planning improved land use and flood control by aerial photography . . 405
Plant
breeders' list by FAO . . . 287
breeding organisations . . . 114
Environment and the Grower (*br*) . 119
Growth Substances (*br*) . . . 426
hormones 125
introduction 104
Protection Ltd. and students' course . 463
staff changes 168
staff visits to Africa . . . 123
science and atomic energy . . . 450
Plants and living space (*ed*) . . . 479
Plantation
Crops, 1952 (*br*) 159
production export crops . . . 243
Rubber Industry, *by D. H. Grist, Dip. Agric.(Cantab.)* 175
Plantings in U.S.A. (*wcr*) . . . 216
Plastics in agriculture 324
Point Four Plan and timber . . . 94
Poison Act 184
Polyacrylic salts (*res dev*) . . . 165
Population in Britain (*ed*) . . . 3
Port of London, The 489
Post-war timber problems . . . 94
Potash developments (*ed*) . . . 392
Potato
conference at Newton Abbot (*ed*) . 220
harvester (*fm*) 212
Potatoes in Hungary (*wcr*) . . . 257
Potentialities of Rubber as a Raw Material for Agricultural Machinery Construction, *by J. M. Beskine, B.Sc., A.M.I.B.A.E.*
Part I 199
Part II 237
Poultry Breeding (*br*) 160
Power units (*fm*) 341
Powling's patent processes . . . 64
Prairie
irrigation 138
weed control 64
Predators and insecticides (*ed*) . . 479
Preparation of latex 186
President for rubber federation . . 335
Press and agriculture (*ed*) . . . 50
Pressure-retaining knapsack (*fm*) . . 214
Preventive medicine and spraying . . 24
Prices of wheat (*ed*) 217
Prinsen Geerligs, Dr. H. C. . . . 472
Problems
and progress of rubber smallholders . 190
of rubber (*ed*) 171
Processing
of cotton seed 327
rubber 190
Production
of Broomcorn 460
of rubber 176
of synthetic rubber (*ed*) . . . 173
and consumption research in rubber . 183
Progress
and problems of rubber smallholders . 190
of agriculture in Malaya (*ed*) . . 172
Project for rice in Gambia (*ed*) . . 259
Propagation by cuttings, a new method (*res dev*) 208
Prospects
for cocoa in the South Pacific . . 393
of rice in Kimberley Division . . 229
Protective clothing and poisons . . 184
Protein
developments (*ed*) 133
extraction from green crops . . 63
from leaves (*ed*) 436
Protess 63
Publications
and reports 339
from FAO 296
by FAO 211
received 297
Publicity and development of rubber . 184
Pulp and timber 93
Pulpwood
and paper 95
supplies 95
Puerto Rico, control of sweet potato weevil 279
Pump manufacture in India 15
Pure Seed Company, The, *by H. Hunter, M.A., D.Sc.* 113
Pyrenone for seed protection (*res dev*) . 38

Q

Quality of raw rubber 192
Quarantine officer in New Guinea . . 70
Queen Elizabeth forest 419
Queensland
Cotton Crop, The, *by L. T. Sardone* . 325
crops 370
sorghum (*ed*) 133

R

Rainfall in South Africa . . . 232
Ramie
in British Honduras (*wcr*) . . . 216
protein supplier (*ed*) 133
Rapeseed in Sweden (*wcr*) . . . 507
Raw rubber quality 192
Reafforestation in South Korea . . 33
Recent
agricultural developments in Iraq . 329
developments in Italian agriculture . 364
FAO publications 338
Reclaimed rubber 177
Reclaiming waste land in Korea . . 33
Reclamation of Land Flooded by Sea Water, The, by *Prof. G. Deloffre* . 485
Reconstruction in South Korea . . 34
Red Spider Mite Control . . . 501
Refrigerator plant in Sweden . . 328
Replanting rubber 191
Reports
and bulletins 128
and publications . 339, 385, 428, 472
from FAO 296

Research
and development organisations in Britain 181
and rubber (*ed*) 171
in pest infestation (*res dev*) . . 425
in rubber today 184
Workers in Agriculture (*br*) . . 504
Reservoir at Tsimlyansk . . . 19
Restriction of rubber production . . 177
Retting
hemp 447
kenaf 51
Reversible disc harrow (*fm*) . . . 474
Revised marginal production scheme . 382
Rice
and FAO (*ed*) 47
and the world (*wcr*) . . . 258, 387
conference of FAO 251
crop experiments in Australia . . 370
in Burma (*ed*) 346
in Europe (*wcr*) 87
cultivation by machinery . . . 119
in New Guinea 17
in the Danube Delta . . . 285
in Zanzibar 466
problems in Niger Delta . . 273
growing mechanised in Fiji . . 283
prospects in Australia . . . 228
Industry in British Guiana, The, *by F. Seal Coon* 280
in China (*wcr*) 343
in Egypt 146
in Hungary (*wcr*) 302
in Indonesia 451
in Japan (*wcr*) 46
in Java (*wcr*) 216
in Malaya (*wcr*) 46
in North Australia, *by George Farwell* . 228
in North Sumatra (*wcr*) . . . 129
institute at Cuttack 112
in Pakistan (*wcr*) . . . 301, 344
in Rumania, *by John Cardew* . . 285
in South Korea (*wcr*) . . . 507
in Spain (*wcr*) 507
in Taiwan 58
in the Philippines (*wcr*) . . 45, 301
in Western Java (*wcr*) . . . 130
in Zanzibar (*wcr*) 88
meeting in Bangkok 90
milling in Egypt 149
production, British Guiana (*wcr*) . 170
in Indonesia 82
project in Gambia (*ed*) . . . 259
prospects in Australia . . . 77
sowings in Australia (*wcr*) . . 130
throughout the world (*wcr*) . . 87
yields in Rumania 286
'Rice field' demonstration in Britain . 334
Ring Culture Method, The, *by Dr. J. R. Booer* 246
Roads in Sicily 419
Robusta
Coffee, *by A. E. Haarer, F.L.S.* . . 352
in Tanganyika 353
in Uganda 354
Root
growth and hormones . . . 125
knot nematodes (*ed*) 134
Rotary
Hoes' European representative . . 214
Indian representative . . . 214
Ltd. (*fm*) 121
Rotations in Taiwan 57
Rothamsted tests (*ed*) 391
Royal
Agricultural Society 78
journal of 149
Show (*ed*) 306
1953 365
1956 367
machinery (*fm*) 298
official exhibits 365
silver medals 365
RRI and breeding 196
Rubber
and economic difficulties . . . 191
and research (*ed*) 171
and P.L.A. 493
and the U.S.A. (*ed*) 260
as a raw material . . . 199, 237
components for agriculture . . 239
conference for Indonesia . . . 193
consumption 178
development and new uses . . 184
federation president 335
for agricultural machinery . . 199
from latex 185
increase (*ed*) 171
Latex as a Raw Material for Industry, *by G. Martin, B.Sc., F.I.R.I.* . . 185
manufactured 200
plantation areas 175
planting material improved . . 176
problems (*ed*) 171
processing 190
production 176
restriction 177
reclaimed 177
replanting 191
Research Institute of Malaya, *by C. E. T. Mann, M.Sc., F.I.R.I.* . . 189
organisation 189
today 184
Smallholders—Problems and Progress, *by L. R. Davidson, B.Sc.(Agric.)* . 190
stocks 179
synthetic (*ed*) 173, 178
to Rio (*ed*) 1
yields 175
Rumanian rice yields 286
Rural
development in Malaya . . . 465
and Industrial Development Authority 192
Rush control (*ed*) 479
Russell, Sir John 41
Russia and the cart and horse (*ed*) . 435
Russian
Comfrey (*br*) 426
irrigation project 18
Rust resistance search 78
Rye in Israel 453

S

Safflower growing in Israel, *by J. Palti and F. Nizani* 266
Saline soil cropping (*ed*) . . . 347
Salt
damage to flooded land . . . 116
and sense (*ed*) 131
Science and Fruit (*br*) 384
Scientific research in the Belgian Congo . 69
ScotMec mill for David Brown tractor (*fm*) 43
Scrub
clearance in Africa 74
in Australia 77
Sea water damage to soil (*ed*) . . 131
Seed
cleaning plant 114
impurities 113
protection and pyrenone (*res dev*) . 38
stock impurities 113
sugar beet 162
Testing (*br*) 40
Seligman-horndraulic grab demonstration (*fm*) 256
Semi-mounted mower (*fm*) . . . 255
Seminar in Latin-America . . . 334
Sesame in Venezuela (*wcr*) . . . 216
Seychelles
and coconut industry . . . 437
and copra 440
pests and diseases 441
Sheep in New Zealand 315
Shell leaflets 37
Ships' holds, disinfestation of . . 499
Siberian farming conditions . . . 136
Sicily
and agricultural conditions . . 417
production 417
and livestock 418
Sicilian roads 419
Silage handling (*fm*) 28
Silver
jubilee of Jealott's Hill . . . 383
medals at Royal Show . . . 365
S. J. Wright to Ceylon 123
Skyhi Ltd. 30
Smithfield
Show (*ed*) 4, 430
1952 26
Society of Chemical Industry's A.G.M. (*ed*) 348
Softwood supplies 95
Soil
and legumes 102
conditioner news (*ed*) . . . 132
improvement research in France (*res dev*) 165
research at Macaulay Institute . . 80
Restoration (*br*) 295
science conference in Southern Australia 370
utilisation in South Korea . . . 32
Solomon Islands and cocoa . . . 395
Some new patents (*res dev*) . . . 294
Sorghum
in Queensland (*ed*) 133
mechanisation (*fm*) 429
South
Africa and wattle bagworm control . 411
maize self-sufficiency (*wcr*) . . 169
wheat and sugar crops (*wcr*) . . 169
African
citrus fruit 290
fruits 398
crop prospects 150, 289, 380, 398, 464
degeneration of citrus clones . . 421
fruit 380
future 180
research 73
grapes 380
hybrid maize . 290, 380, 398, 454
progress and development in irrigation 232
rainfall 232
soya beans 398
sugar 290, 380, 398
(*wcr*) 343
Turkish tobacco 290
water laws 233
wheat (*wcr*) 257
American fertilisers (*ed*) . . . 478
Korean
agriculture 32
rice crops (*wcr*) 507
Pacific and cocoa prospects . . 393
and copra, cocoa and coffee . . 124
Commission and cocoa (*ed*) . . 48
and coconut survey . . . 16
1951 40
conference 223
Southern
Rhodesia and tobacco strains . . 108
Rhodesian farms analysed . . . 31
fertiliser prices 227
tea prospects (*wcr*) . . . 45
tobacco (*wcr*) 216
(*ed*) 262
growers (*wcr*) 45
grass leys 471
Rhodesia's 'Royal' 145
U.S.A. drought (*ed*) 390
Soya
beans and the world (*wcr*) . . . 344
in South Africa 398
Soybean Industry, The (*br*) . . . 159
Spanish crops (*wcr*) 431
Spice in Madagascar (*wcr*) . . . 216
Sponge from latex 186
Spray
nozzles (*corr*) 467
by R. J. Courshee, B.Sc. . . . 321
Spraycrop 25 (*fm*) 83
Sprayer filter and strainer (*fm*) . . 342
Spraying
bulletin (*fm*) 474
circus tour (*fm*) 506
in orchards 416
losses 111
machine by Pest Control (*fm*) . . 430
for 1953 (*fm*) 121
price preductions (*fm*) . . 167
research 24
machines, requisites for . . . 109
Spread of swollen shoot (*ed*) . . 49
Spruce budworm control . . . 363
Stocks of rubber 179

Stored grain protection (*fm*) . . . 167
Students' course given by Plant Protection Ltd. 463
Submersible water pump (*fm*) . . 506
Sudan, cotton pests in 72
'Sudden death' disease and cloves . 414
Sugar
agreement (*ed*) 435
and P.L.A. 492
and the world (*wcr*) 344
beet conference 162
harvester (*fm*) 121
in Japan (*wcr*) 216
in U.S.A. (*wcr*) 257
outlook in Canada (*wcr*) . . . 169
cane and organo-mercurial fungicides . 497
harvester from Hawaii (*fm*) . . 42
in Natal (*wcr*) 46
technologists' meeting . . . 463
varieties in Mauritius (*ed*) . . 219
conference (*ed*). 305
in London 378
crop, British Guiana (*wcr*) . . 170
Paraguay (*wcr*) 130
factory in India 421
in B.W.I. (*wcr*) . . . 87, 475
in Cuba (*wcr*). 432
in East Africa 355
in India 289
(*wcr*) 431
in Mauritius (*wcr*) 475
in South Africa . . 290, 380, 398
(*wcr*) 169, 343
production, East Java (*wcr*) . . 170
Sulphur shortage in the U.S.A. . . 107
Summer rye varieties in Israel . . 453
Superphosphate
Association Meeting 377
discussions 464
in the U.S.A. 105
Supplies of jute (*corr*) 206
Swamplands of Northern Rhodesia . 150
Swathe widths in drift spraying . . 109
Swedish
oilseed (*wcr*) 88
rolling refrigerator plant . . . 328
rapeseed (*wcr*) 507
Sweet potato weevil control in Puerto Rico 278
Swollen
shoot of cocoa in Gold Coast (*ed*) . 389
problem 74
spread (*ed*) 49
Symposium of Colston Research Society 174
Synthetic
rubber 178
production (*ed*) 173
Sytem, a new systemic insecticide (*res dev*) 117
Systemic
Fungicides, *by P. W. Brian, Sc.D.* . 204
insecticides and Pest Control Ltd. . 22

T

Taiwan
agriculture 56
food production 58
land reform 58
pest and disease control . . . 57
Tanganyika and robusta coffee . . 353
Tapping Hevea 194
TCA and weed control (*ed*) . . . 173
Tea
and coffee rival (*ed*) 304
and P.L.A. 491
in New Guinea 413
in Southern Rhodesia (*wcr*) . . 45
Pests and Diseases and Their Control (*br*) 118
problems (*ed*) 2
propaganda in India 447
Technical
co-operation scheme (*ed*) . . . 47
instruction in South Korea . . 34
news 17, 85, 122, 145, 208, 258, 269, 334, 385, 424, 472, 502
Tenure of land (*ed*) 134
Teosinte, protein suppliers (*ed*) . . 133
Tests at Rothamsted (*ed*) . . . 391
Textbook of West African Agriculture (Soils and Crops) 295
Thermal Fog for the Control of Insect Pests in Forests and Plantations, *by D. Boocock* 409
Thorn apple 66
Thornless Mimosa (*res dev*) . . . 37
Threats to West African cocoa (*ed*). . 389
T.I.F.A. 411
Tilaiya project 307
Timber
and pulp 93
conference of 1949 94
possibilities in the Amazon . . 281
Time and trace elements (*ed*) . . 174
Tobacco
and P.L.A. 492
growers in Southern Rhodesia (*wcr*) . 45
industry in Australia (*corr*) . . 29
in Canada (*wcr*) 88
in Greece (*wcr*) 87
in Israel (*wcr*) 120
in Italy 484
in Morocco 99
in Southern Rhodesia (*wcr*) . . 216
(*ed*) 262
problems in Southern Rhodesia . . 73
strains popular in Southern Rhodesia . 108
world forecast (*wcr*) 129
Tomato disorder (*ed*) 436
Top
dressing operations in Britain . . 422
dressings and New Zealand pastures (*res dev*) 37
Toxic
chemicals in agriculture . . . 340
weed control 64
Trace
element assimilation (*ed*) . . . 91
elements and time (*ed*) . . . 174
Tractor
exports to Denmark (*fm*) . . . 84
lighting sets (*fm*) 300
tests 36
training in Malaya (*corr*) . . . 207
Tractors
clear grassland (*fm*) 214
with hydraulic lifts 207
Trade
publications 158
received 44
Trainees visit Pest Control Ltd. . . 252
Trap cropping of witchweeds . . 264
Tree Growing and Forestry in Morocco, *by C. H. Brown, B.Sc.* 141
Trench
digger and pipe layer (*fm*) . . . 28
excavator (*fm*) 341
Trials with jute in British Colonies . 276
Tropical
agricultural education 270
agriculture, legumes in 101
Australia 228
Tropics and Dutch agricultural developments 331
Tsimlyansk reservoir 19
Tunisian olive oil (*wcr*) . . . 257
Turkish
cotton (*wcr*) 257
tobacco in South Africa . . . 290

U

Uganda
and robusta coffee 354
cotton (*wcr*) 301, 475
forestry policy (*corr*) 206
U.K.
farm economics (*ed*) 173
fertiliser demonstrations . . . 227
United
States and superphosphate . . . 105
fertiliser changes 105
Urena lobata 54
U.S.A.
and hemp 446
and rubber (*ed*) 260
control of gypsy moth 410
cotton (*wcr*) 257, 476
cottonseed (*wcr*) 301
drought in the south (*ed*) . . . 390
flaxseed (*wcr*) 343, 507
plantings (*wcr*) 216
grain crops (*wcr*) 343
sugar beet (*wcr*) 257
wheat (*wcr*) 257, 343
winter wheat (*wcr*) 301
Use of Lime in British Agriculture, The (*br*) 470
Uses for hemp 446
U.S.S.R.
agricultural production 7
irrigation project 18
spring grains (*wcr*) 387

V

Varieties
of hemp 446
of Summer Rye in Israel, *by Dr. Menko Plaut and Jacob Ventura, M.Sc.* . . . 453
Vegetable
oil in Canada (*ed*) 348
seed oil in Italy (*wcr*) 387
Vegetables
and insecticidal residues (*ed*) . . 262
in Florida 127
Vegetation
in the Negev 61
of arid regions 60
Venezuela, sesame (*wcr*) . . . 216
Venezuelan agricultural service . . 31
Virginian-type tobacco in India (*wcr*) . 130
Virus
disease control 23
yellows problem 162
Visitors at the Smithfield Show . . 29
Volga-Don Irrigation Prject, The . . 18
Volta River project 108

W

Wadi arabah, the. 60
Wales and England, crops, 1952 (*wcr*) . 216
Wall spraying with Dieldrin . . . 226
Wallace, Prof. T.. 214
Water
desalting (*ed*) 220
hyacinth (*ed*) 172
laws in South Africa 233
supplies for spraying. 109
Wattle bagworm control in South Africa. 411
Wealth of India, The (*br*) . . . 254
Weather and spraying losses . . . 111
Webworm fall experiments . . . 412
Weed
control 24, 126
and TCA (*ed*) 173
conference in Britain . . . 384
Conference, The (*Ed*) . . . 480
growth control (*res dev*) . . . 76
Weedkillers in U.S.A. and Canada. . 180
West
African agricultural research . . 120
cocoa threats (*ed*) 389
Asia, deserts 60
European agricultural production . 7
German agriculture 335
Indian agricultural research . . 120
Indies, development in (*ed*) . . 477
Java rice (*wcr*) 130
Pacific cocoa production (*ed*) . . 48
Western
Canada's Irrigation Schemes, *by P. A. Rowe* 138
Samoa and cocoa . . . 97, 395
Wheat
agreement (*ed*) 217, 390
areas in Australia 297
Australian estimate (*wcr*) . . . 130
breeding in Australia 11
conference of FAO 382
crop record, world 165
South Africa (*wcr*). 169
harvest in Australia (*photographs*) . 161
imports by Pakistan 128
in Argentina (*wcr*) 302

in Australia 12
(*wcr*) 258, 301
in Austria (*wcr*) 431
in Egypt (*wcr*) 431
in India (*wcr*) 387
in Mexico (*wcr*) 387
in Morocco 100
in South Africa (*wcr*) 257
international agreement (*ed*) . . 47
in U.S.A. (*wcr*) . . . 257, 343
in the Argentine (*wcr*) . . . 387
in the Netherlands (*wcr*) . . . 432
pact and Australia 413
prices (*ed*) 217
production campaign in Brazil (*wcr*) . 169
shortage in Pakistan 297
varieties in Australia 12
Wheel tracklayer tractor conversion (*fm*) . 43
Wild rye in Israel 453
Willows—a Valuable Genus, *by Donald Mullins* 143
Winter
wheat and U.S.A. (*wcr*) . . . 301
throughout the world (*wcr*) . . 302
Witches'
broom disease control . . . 399
of cocoa 399
(*ed*) 390
Witchweed
chemical control 265
control 264
Witchweeds
of Africa, The, *by K. Wilson Jones, M.Sc.* 263
trap cropping 264
World
agricultural production, 1951-52 . 5
and flax (*wcr*) 258
and pineapples (*wcr*) 258
and rice (*wcr*) 258
and soya beans (*wcr*) 344
and winter wheat (*wcr*) . . . 302
barley and oats production (*wcr*) . 508
cacao forecast (*wcr*) 129
cotton production (*wcr*) . . . 388
1952-53 (*wcr*) 46
citrus fruits (*wcr*) 476
fertiliser production and consumption (*ed*) 306
food situation (*ed*) 1
maize production (*wcr*) . . . 302
rice crop (*wcr*) 87
production (*wcr*) 287
sugar production (*wcr*) . . . 344
Timber and Pulp—Requirements and Supplies, *by J. J. MacGregor, B.Litt., B.Sc., M.S.* 93
tobacco forecast (*wcr*) . . . 129
wheat record anticipated . . . 165
Wound hormones 125

Y

Yields
and mechanisation (*ed*) . . . 346
of a Crop, The (*br*) 337
of rubber 175
Yugoslavia and grain (*wcr*) . . . 431

Z

Zanzibar
and clove research (*ed*) . . . 261
and Pemba clove industry . . . 414
rice (*wcr*) 88
cultivation 466

AUTHOR INDEX

BAPTIST, E. D. C., Ph.D. (Lond.), M.Sc., A.R.C.S., D.I.C. : Improvement of Yields in Hevea Brasiliensis . . 194
BARNES, A. C., C.M.G.:
Agricultural Planning in East Africa 481
Cane Sugar in East Africa . . 355
BESKINE, J. M., B.Sc.(Eng.), A.M.I.B.A.E.: The Potentialities of Rubber as a Raw Material for Agricultural Machinery Construction
Part I 199
Part II 237
DE BLANK, S., B.Sc.: Co-operation and Integration in Oil Palm Research . 221
BOOCOCK, D.. Thermal Fog for the Control of Insect Pests in Forest and Plantations 409
BOOER, Dr. J. R.: The Ring Culture Method 246
BRIAN, P. W., Sc.D.: Systemic Fungicides 204
BRIANT, A. K., M.A., Dip.Agric.(Cantab.), A.I.C.T.A.: The Clove Industry in Zanzibar and Pemba. 414
BROWN, C. H., B.Sc.:
The Agricultural Possibilities of Morocco 98
Tree Growing and Forestry in Morocco 141
Agricultural Problems of the Niger Delta 273
BROWN, CHARLES P., D.Sc.: The Development of Citrus Cultivation in Egypt . 442
CANN, H. J., H.D.A.: Bunchy Top Disease of Bananas in N.S.W. 67
CARDEW, JOHN: Rice in Rumania . . 285
CASS, W. G.:
Agriculture in Taiwan 56
Agricultural Research in the Belgian Congo 69
Soil Improvement Research in France (*res dev*) 165
CHASE, J. L. H.: Continuous Cloches for Early Crops 494
COON, SEAL F.: The Rice Industry in British Guiana 280
COURSHEE, R. J., B.Sc.:
Developments in Drift Spraying. . 109
Spray Nozzles 321
The Economy of Chemical Pest Control 368
CURTIS, HARRY A.: Changes in the Fertiliser Industry of the United States . 105
DARCEL, F. C.: Investigations in Citrus Production (with special reference to the Nutrition of the Crop). . . . 153
DAVIDSON, L. R., B.Sc.(Agric.): Rubber Smallholders—Problems and Progress. 190
DEBENHAM, Prof. FRANK, M.C., O.B.E., M.A., D.Sc.: The Bangweula Swamps 150
DELOFFRE, Prof. G.: Reclamation of Land Flooded by Sea Water 485
DUROCHER-YVON, F., M.B.E., Dip.Agric. (Maur.): The Coconut Industry of Seychelles 437
FARWELL, GEORGE: Rice in North Australia 228
DE FELLNER, Dr. C.: Green Manuring in India and Pakistan 318
FISHLOCK, C. W. L., B.Sc., A.I.C.T.A.: Education in Tropical Agriculture . 270
FOSTER, FRANK: Front-End Loaders in Agriculture 30
FINDLAY, MARJORIE: Greenland's Experiment in Agriculture 457
GEE, GEOFFREY, Sc.D., F.R.S.: The International Organisation of Research and Development in the Natural Rubber Industry 181
GREENHILL, W. L., M.E.: Harvesting Flax Crops in Australia 375
GRINDROD, JOHN, B.A.(Com.):
Mechanisation of Agriculture in India 15
Artificial Grass Drying in the Netherlands 331
Forestry in Canada 359
Nutrition and Agriculture in Indonesia 451
GRIST, D. H., Dip.Agric.(Cantab.): The Plantation Rubber Industry . . 175
HAARER, A. E., F.I.S.:
Congo Jute and its Potentialities. . 54
Robusta Coffee 352
Hemp (Cannabis sativa) 445
HARDY, ERIC, F.Z.S.: Cultivation of Arid Zones—Research and Progress in the Near-East 59
HENDRIE, D. S., B.Sc.(Agric.) (Est. Man.), N.D.A., N.D.D.: New Zealand Farming 313
HENDRIE, J. I., M.A.: Aldrin and Dieldrin, Part II 277
HOPKINS, D. P., B.Sc., F.R.I.C.: Fertilisers in Economic Use 402
HUNTER, H., M.A., D.Sc.: The Pure Seed Company 113
ILLINGWORTH, FRANK: Farming Within the Arctic Circle 135
LEYLAND COLE, L. W., M.Sc., B.Sc. (Agric.), F.R.I.C.: Aldrin and Dieldrin, Part I 224
MANN, C. E. T., M.Sc., F.I.R.I.: The Rubber Research Institute of Malaya . 189
MARTIN, G., B.Sc., F.I.R.I.: Rubber Latex as a Raw Material for Industry . 185
MASON, R. R., B.Sc., N.D.A., Dip.Agric. (Cantab.): Mechanised Agriculture in Fiji 282
MOWRY, Dr. HAROLD: Minor Element Deficiencies in Coffee in Costa Rica . 455
MULLINS, DONALD: Willows—a Valuable Genus 143
MACGREGOR, J. J., B.Litt., B.Sc., M.S.: World Timber and Pulp—Requirements and Supplies 93
MACLAGAN GORRIE, R., D.Sc.: Aerial Photography as an Aid in Planning Improved Land Use and Flood Control 405
OBERHOLZER, Prof. P. C. J.: Degeneration of South African Citrus Clones . . 420
OCHSE, J. J.: Note on a New Quick Method of Propagation of Cuttings (*res dev*) 208
PALTI, J.: Aircraft in Israeli Agriculture . 157
PALTI, J., and NIZANI, F.: Safflower Growing in Israel 266
PLANKA, M., M.Sc., A.R.I.C.: Sytam, a New Systemic Insecticide (*res dev*) . 117
PLAUT, Dr. MENKO: Varieties of Summer Rye in Israel 453
RAMANATH, S.: The Damodar Valley Project 307
RIPPER, W. E., Ph.D., F.R.E.S.: Pest Control Ltd.
Part I—In Britain 21
Part II—Overseas 71
ROWE, P. A.: Western Canada's Irrigation Schemes 138
ROWLAND, J. W.: Devising Systems of Permanent Agriculture in Southern Rhodesia. 349
SARDONE, L. T.: The Queensland Cotton Crop 325
SLUIS, K. J. H. VAN: Drug Plant Cultivation in the Netherlands 65
STAUB, SERGE, A.R.T.C., A.M.I.Mech.E., and E. LIMFAT: Kenaf in Mauritius . 51
TEMPANY, Sir HAROLD, C.M.G., C.B.E., D.Sc., F.R.I.C.: The Influence of Introduced Crops on Colonial Economies 241
VENTURA, JACOB, M.Sc.(Agric.): Varieties of Summer Rye in Israel 453
WALKER, T. W., B.Sc., Ph.D., A.R.C.S.: Molybdenum on New Zealand Pastures 267
WHYTE, R. O., Ph.D., D.Sc.: Legumes in Tropical Agriculture. 101
WILLIAMS, R. O., O.B.E.: The Clove Industry of Zanzibar and Pemba. . 414
WILLIS, S. J., B.Sc.(Agric.): Cardaria Draba—a Globe-Trotting Weed . 310
WILSON JONES, K., M.Sc.: The Witchweeds of Africa 263

How to turn unused land into pasture

Today, thousands of acres of pasture are being developed out of land that has long lain useless. How? With Caterpillar Diesel Tractors and equipment specially built for use with them in land clearing.

In the picture above, a D4 Tractor, equipped with a root rake, makes quick work of clearing acreage for grazing. The sketches below show how the root rake removes brush and roots but lets the topsoil drift through its teeth and remain in place. That way, you save the valuable topsoil and pile earth-free brush for burning.

The root rake is only one of several land-clearing tools specially designed for Caterpillar-built Tractors. When you clear land, look to Caterpillar equipment for money-saving performance.

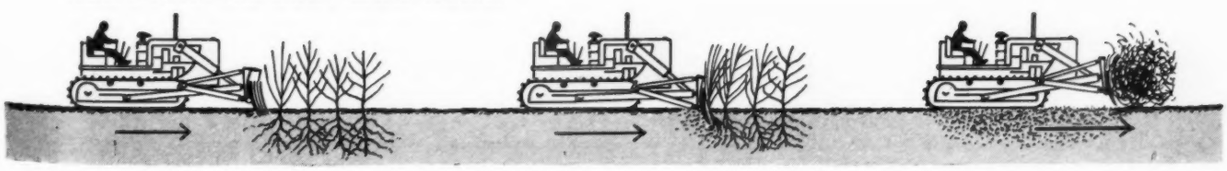
Caterpillar Tractor Co., Peoria, Illinois, U. S. A.

CATERPILLAR

REGISTERED TRADE MARK

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

HERE'S HOW THE ROOT RAKE WORKS



Index to ADVERTISERS

	Page
Agricultural Engineers' Assoc.	xxvi
Allied National Corp. Ltd.	Sept.
Allman, E., & Co. Ltd.	xxix
American Chemical Paint Co.	v
Armstrong Danarm, Clubley, P.	xvi
Association of Agriculture	xxi
Badger Machine Co.	Sept.
Bean, John, Division	Nov.
Berendsen, S., Ltd.	xvi
Berk, F. W., & Co., Ltd.	xxvii
B.O.E. & C.C. Ltd.	xxxiii
Bristol Tractors	xxiii
British Schering Ltd.	xxviii
B.S.A. Industrial Engines	Nov.
Burmex Spraying Equip. Ltd.	Nov.
Burt, Boulton & Haywood Ltd.	viii
Carter, J. Harrison, Ltd.	xviii
Catchpole Engineering Co. Ltd.	Sept.
Caterpillar Tractor Co.	iii and xi
Chase Cultivation Ltd.	xviii
Chemical & Carbon Prod. Ltd.	viii
Classified Advertisements	xxxvii-xxxviii
Clean Crops Ltd.	xxxvi
Clifford Aero & Auto. Ltd.	Nov.
Cooper, Pegler & Co. Ltd.	xxxix
County Commercial Cars (Sales) Ltd.	Oct.
Craven, W. J., & Co. Ltd.	Nov.
Curran, Edward, Engng. Ltd.	Oct.
Dashwood Engineering Ltd.	Sept.
Denings of Chard	vi
Diamond Alkali	Cover iv
Dorman Sprayer Co. Ltd.	xxvi
Drake & Fletcher Ltd.	Nov.
Engleberg Huller Co. Inc.	Nov.
English Drilling Equip. Co. Ltd.	xii
Fertosan Ltd.	xxxiii
Ford of Dagenham	xx
Gallenkamp, A., & Co. Ltd.	xv
Grant, Lewis C.	Nov.
Gunson, R. W., (Seeds) Ltd.	vi
Halse, John W.	Oct.
Hercules Powder Co. (Inc.)	vii
Hudson, H. D., Manufacturing Co.	x
Hudson, Kenneth, & Son	Nov.
Jahn, Henry R., & Son (Inc.)	viii and xxiv
Kelvin Construction Co. Ltd.	ix
Kennedy & Kempe Ltd.	Nov.
King, Geo. W.	Nov.
Malaya House	Nov.
Marden Manufacturing Co.	Sept.
Marks, A. H., & Co. Ltd.	Cover ii
Meldrum, D., & Sons	xxvi
Microsol Ltd.	Nov.
Mirvale Chemical Co.	Nov.
Mitchell Engineering Co. Ltd.	iv
Monsanto Chemicals Ltd.	Cover iii
Murphy Chemical Co. Ltd.	Nov.
N.V.C.P.	xxxii
Oberdorfer Foundries Inc.	xiv
Olding, Jack, & Co. Ltd.	Oct.
Oliver Corporation, The	xxv
Pan Britannica Industries Ltd.	Cover i & xxi
Penny & Porter Ltd.	xviii
Pest Control Ltd.	xxxv
Piper Aircraft Corporation	xxxi
Plant Protection Ltd.	xl
Port of London Authority	Nov.
Pyke, Joseph, & Son (L'pool) Ltd.	Oct.
Ransomes, Sims & Jeffries Ltd.	xxiv
Rotary Hoes Ltd.	xxiii
Safety Products Ltd.	xxxix
Salopian Engineers Ltd.	xii
Shell Petroleum Co.	xxii
Spraying Systems Co.	Nov.
Stafford, Allen, & Sons Ltd.	Nov.
Steel Fabricators (Cardiff) Ltd.	xiv
Swingfire Ltd.	xiii
Taylor Woodrow Ltd.	xvii
Tecalemit Ltd.	xix
Universal Crop Protection Ltd.	x
WAECO LTD. (FUMITE Division)	xiv
Waldron, Phillip B., Co.	xxiv
Walker, T. R., Ltd.	xxxii
Wolseley Sheep Shearing Machine Co., Ltd.	xvi

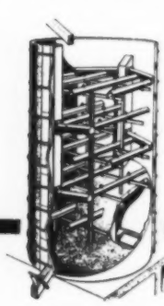
TO ADVERTISERS

Blocks for use in advertisements in WORLD CROPS, which are sent to us from outside the United Kingdom must be labelled :

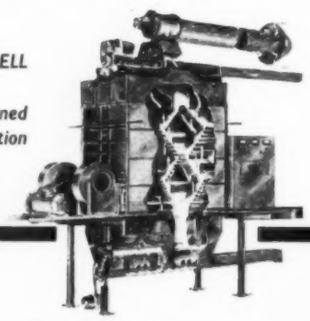
'For reproduction in an advertisement in a British Trade Journal. For return or destruction after use. No commercial value. Reference BO/31505/32.'

Make the most of a Good Crop

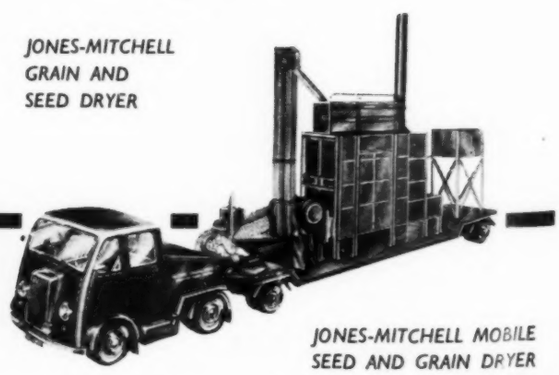
The Jones-Mitchell Grain and Seed Dryers have many outstanding features particularly for those concerns who insist on a high quality dried milling, malting or seed sample. It completely safeguards germination; its economy of operation is unequalled by any other seed or grain dryer; is suitable for installation in single or multiple floor buildings and can be heated by means of Electricity, Steam or Oil. A mobile version of this machine is illustrated below and is well suited for tropical operation. Machines of this type have been supplied to Government organisations in Malaya and Kenya.



JONES-MITCHELL BIN DRYER specially designed for farm operation



JONES-MITCHELL GRAIN AND SEED DRYER



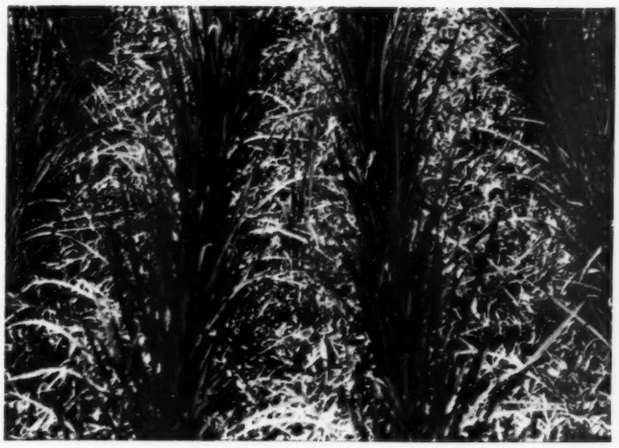
JONES-MITCHELL MOBILE SEED AND GRAIN DRYER

Write for full particulars and illustrated brochures

JONES-MITCHELL GRAIN DRYING EQUIPMENT

Mitchell Engineering Ltd., Food Machinery Division, Dept. C, 7 Gower St., London, W.C.1

P 3042



Before Weedone treatment

After Weedone treatment

WEEDONE®

HERBICIDES

SAVE RICE GROWERS A LOT OF MONEY

Weeds in rice reduce profits, because they result in lower yields and increased labor costs. By using the right Weedone herbicides, growers can

1. Increase yields 520 to 880 kg. per hectare
2. Reduce labor costs by eliminating hand weeding
3. Improve quality of rice by eliminating weed seeds which cause mildew in storage
4. Reduce harvesting costs by eliminating weeds which slow up combining

THE RIGHT WEED KILLER FOR EVERY PURPOSE

Weedone LV-4. The powerful, low-volatile butoxy ethanol ester of 2,4-D. Minimizes danger of vapor damage to nearby susceptible plants. The greatest cropland herbicide.

Weedone Brush Killers and Weedone 2,4,5-T. Low-volatile butoxy ethanol ester formulations for general brush control and for special problems such as wild blackberry and other brambles, mesquite, osage orange and palmetto.

Weedone Concentrates. Highly effective ethyl, isopropyl or butyl ester formulations of 2,4-D. For application where volatility is not a problem.

Weedar.® Highly concentrated formulations of the amine salts of 2,4-D.

Weedar MCP. The amine salt formulation of 2-methyl-4-chlorophenoxyacetic acid. For small-grain crops underseeded with legumes.

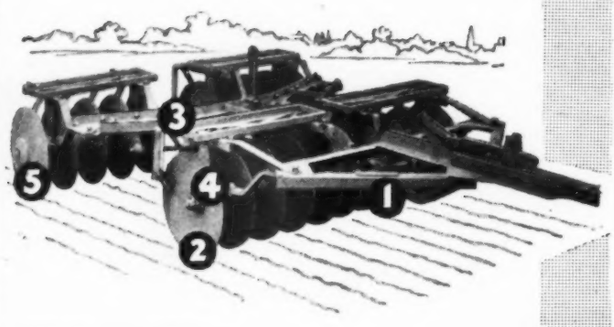
Weedex. Sodium salt formulations of 2-methyl-4-chlorophenoxyacetic acid.

Write for the name of your nearest Weedone distributor

AMERICAN CHEMICAL PAINT COMPANY, AMBLER, PA., U.S.A.

Originators of 2,4-D and 2,4,5-T Weed Killers

Chemicals ACP Processes



NOTE FOR HILL FARMERS

In field tests the B.M.B. 'President' pulled this harrow up gradients of 1 in 6 with ease.

KNOWN THE WORLD OVER

A SOMERSET HARROW FOR THE 'PRESIDENT'

This new 5'6" harrow has been specially 'tailor-made' for the B.M.B. 'President' tractor by Denings of Chard.

It is similar in design and construction to the tried and tested larger models, but it is specially matched to work at the best load efficiency of the 'President' or tractors of similar drawbar power.

1. **Heavy angle steel frame**
2. **High-grade steel 18" discs**
3. **Strong angle steel weighted trays**
4. **Tecalemit pressure lubrication**
5. **Five different angles of disc setting**

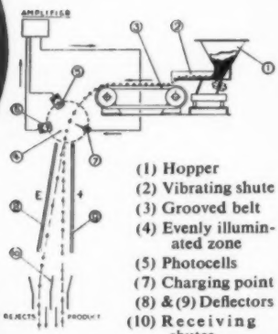
For full details of this new harrow please write to Dept. W

SOMERSET FARM MACHINERY

AT WORK ALL OVER THE WORLD

DENINGS OF CHARD LTD.

CHARD, SOMERSET, ENGLAND *Tel.* 2284



(1) Hopper
(2) Vibrating shute
(3) Grooved belt
(4) Evenly illuminated zone
(5) Photocells
(7) Charging point
(8) & (9) Deflectors
(10) Receiving shutes

The separating of the rejected and sound product takes place automatically in mid-air.

Electronic Colour Sorting

It is often possible to mislead the human eye but when it comes to a critical colour sorting operation, the "magic eye" of the GUNSON SORTEX machine cannot be deceived.

The photographs illustrate its uncanny accuracy in isolating an admixture of 3½% coloured and stained beans from the sound bulk. In the same way Coloured Beans, Coffee, Peas, Nuts, Seed Maize and other articles of similar size can be upgraded with equal results. We invite you to send us a 2lb. sample of your product for treatment and report. The SORTEX not only separates articles of different colours but also shades of the same colour.

The diagram on the left illustrates the basic working of the SORTEX Model Type G.2. Each machine is a compact and entirely self-contained unit, normally arranged for 220/240 v. single phase, 50 cycles A.C. Other voltages by arrangement. Machines now in operation are doing 24 hours service.

R. W. GUNSON (SEEDS) LTD

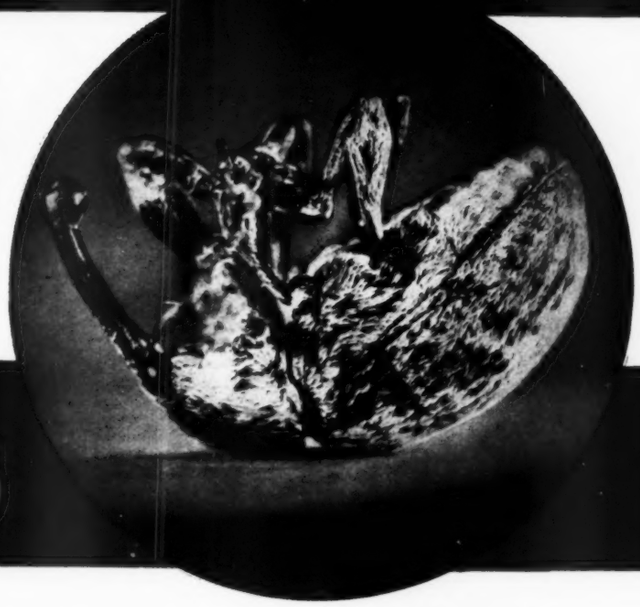
WHOLESALE SEEDSMEN

20/21 ST. DUNSTAN'S HILL · LONDON EC3 · ENGLAND

Patentees and Sole Makers *U.K. Patent No. 617276* *U.S.A. Patent No. 2536693 and other World Patents*

toxaphene kills insect pests

INSECTICIDES based on toxaphene (chlorinated camphene 67-69% Cl) kill a wide variety of insect pests, some of which are listed below. Toxaphene insecticides are used the world over. If agricultural authorities in your area have not fully tested toxaphene dusts or sprays, write for specific details to Hercules—the manufacturer of toxaphene.



Alfalfa weevil
Hypera postica (Gyll.)
Armyworms
Cirphis unipuncta (Haw.) et al
Bean Fly
Agromyza phaseoli (Coq.)
Boll weevil
Anthonomus grandis Boh.
Bollworm
Heliothis armigera (Hbn.)
Chinch bug
Blissus leucopterus (Say)
Clover seed chalcid
Bruchophagus gibbus (Boh.)
Cotton aphid
Aphis gossypii Glov.
Cotton fleahopper
Psallus seriatus (Reut.)
Cotton leafworm
Alabama argillacea (Hbn.)
Cutworms
Agrotis ypsilon (Rott.) et al
Grasshoppers (locusts)
Spp.
Lice
Haematopinus eurysternus (Nitz.) et al
Lygus
Lygus spp.
Peanut (potato) leafhopper
Empoasca fabae (Harr.)
Pear psylla
Psylla pyricola (Foerst.)
Rapid plant bug
Adelphocoris rapidus (Say)
Salt-marsh caterpillar
Estigmene acrea (Drury)
Sheep tick
Melophagus ovinus (L.)
Southern green stink bug
Nezara viridula (L.)
Soya bean leaf beetle
Phaedonia inclusa (Stil.)
Spittlebugs
Philaenus lineatus (L.) et al
Sweetclover weevil
Sitona cylindricollis Fahr.
Thrips
Spp.
Ticks
Boophilus annulatus (Say) et al
Velvetbean caterpillar
Anticarsia gemmatilis (Hbn.)
Wattle bagworm
Acanthopsyche junodi (Heyl.)
Webworms
Loxostege similalis (Guen.) et al

List gives common and scientific names approved by the American Association of Economic Entomologists

Naval Stores Department
HERCULES POWDER COMPANY
INCORPORATED
977 *King St., Wilmington* 99, *Delaware, U.S.A.*

Hercules Powder Company, Ltd., 140 Park Lane, London, W. 1, England • N. V. Hercules Powder Company, Lange Vijverberg 12, The Hague, Holland

NX52-30

manganese . . .

. . . Our Agricultural Department collects from all over the world authoritative information about the occurrence and control of manganese deficiencies affecting crops and live-stock. This information is at the disposal of readers of this journal. A descriptive leaflet may be obtained from our Agricultural Department.

★ ★ ★

Ask your distributor about supplies of manganese compounds.

★ ★ ★

CHEMICAL & CARBON PRODUCTS LTD.
24H ST. GEORGE STREET, HANOVER SQUARE, LONDON, W.1
Telephone: MAYfair 7132 Cables: CHEMICARBO, LONDON

PIXTONE

THE *New* MECHANICAL STONEPICKER

Now, at last, you can easily remove from your fields those troublesome stones that cause so much implement breakage, slow up plowing, cultivating and harvesting, and decrease soil productivity.

The answer is PIXTONE, the new mechanical stone picker that picks up all stones from 1½ to 8 inches in diameter, and carries and dumps them wherever you wish. PIXTONE will clear up to 4 acres a day, is easily pulled by any 2-plow tractor. Self-contained gasoline motor furnishes power to operate picking mechanism.

It will pay you to investigate this tremendous labour saving machine. For full particulars write to—

Henry R. Jahn & Son, Inc.
9 WATER STREET, NEW YORK 4, N.Y., U.S.A.

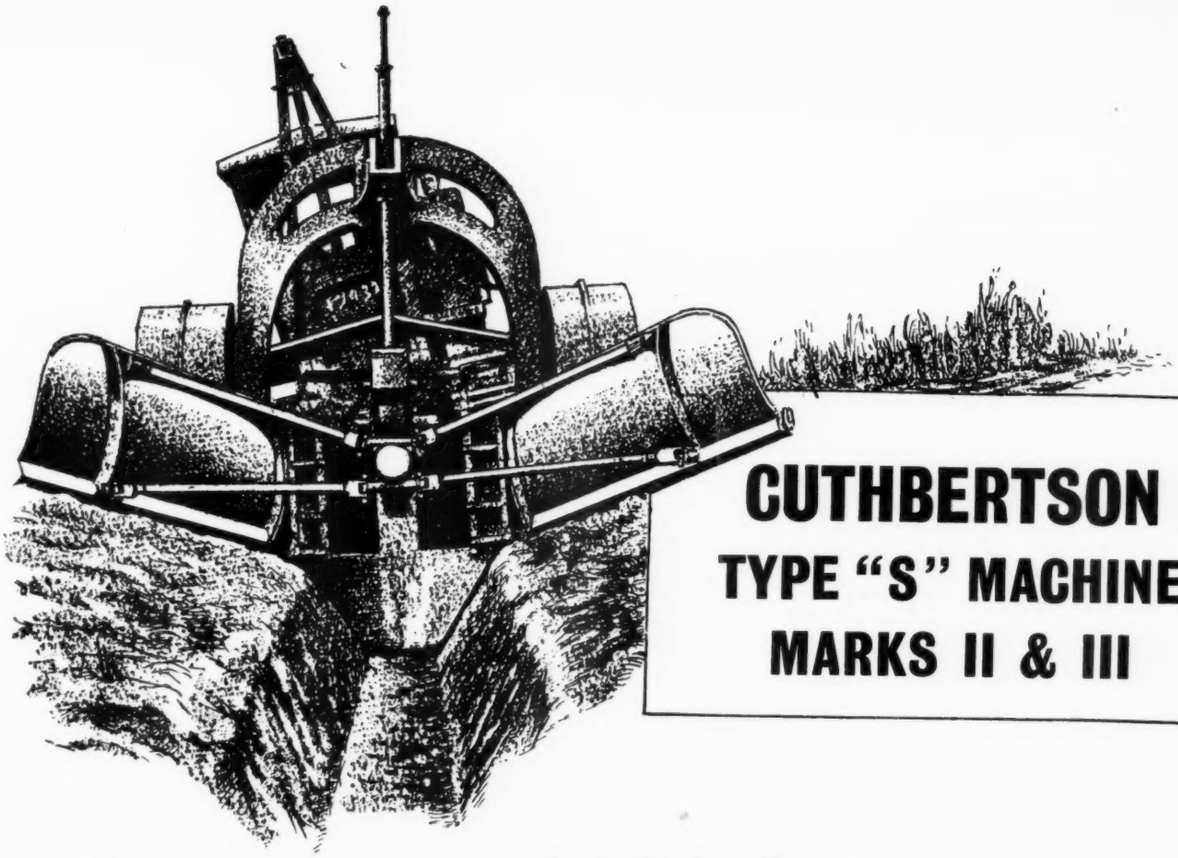
Talinè REG'D

SELECTIVE WEED KILLERS
of

- **HIGH AVERAGE CHEMICAL QUALITY**
- **PROVED BIOLOGICAL PERFORMANCE**
- **COMPETITIVE PRICE**

2,4-D AMINE SALT containing 50% w/v 2,4-Dichlorphenoxyacetic acid.
2,4-D ACID a white powder of minimum 98% purity for formulation.
2,4-D SODIUM SALT a fine flowable powder containing a minimum of 80% 2-4-D Acid.
MCPA SPRAY a standard product containing 30% MCPA.
DNOC SELECTIVE WEED KILLER a paste with good suspension properties containing 3 lb. of activated Dinitro-ortho-Cresol per gallon.
BRUSHWOOD KILLER a combination of low volatile esters of 2,4-D and 2,4,5-T containing 50% w/v 2,4-D Acid and 25% w/v 2,4,5-T Acid.
2,4-D ESTER FLUID a low volatile ester containing 50% w/v 2,4-D Acid.
2,4,5-T ESTER FLUID a low volatile ester containing 50% w/v 2,4,5-T Acid.

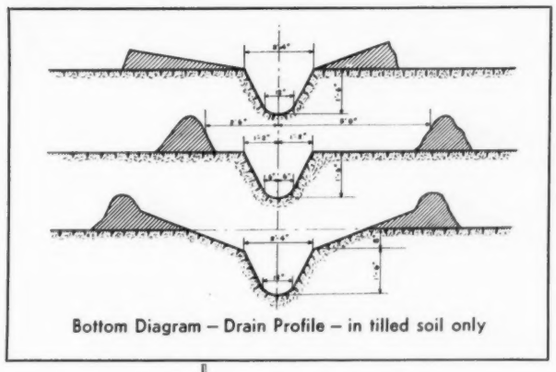
BURT, BOULTON & HAYWOOD LIMITED
CRABTREE MANORWAY · BELVEDERE · KENT Tel: Erith 3066



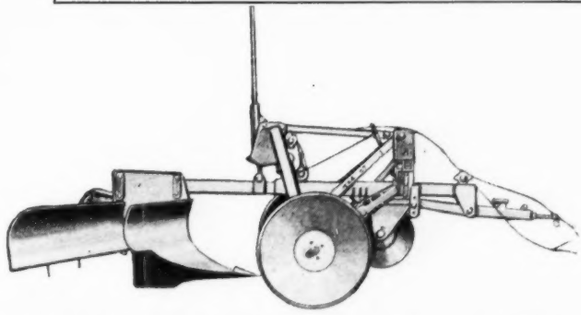
CUTHBERTSON
TYPE "S" MACHINE
MARKS II & III

Draining and Ridging
at 3 miles per hour

From the heavy clay of West Indian Sugar Plantations to the soft peat in Eire, Cuthbertson Type "S" Machines are knocking the expense out of drain cutting and bed preparation. The diagrams alongside show the type of drain cut and the varying spread of the "spoil" provided by the adjustable grader wings. Note the additional "top taper" that can be cut in tilled soil by suitable setting of these wings, thus gaining up to 8in. extra depth of cutting by the mouldboard. The Mark II machine ploughs to 18in. depth and the Mark III to 28in. Mouldboards are supplied to cut any size and shape of drain.



Bottom Diagram – Drain Profile – in tilled soil only



KELVIN
CUTHBERTSON
AGRICULTURAL MACHINES

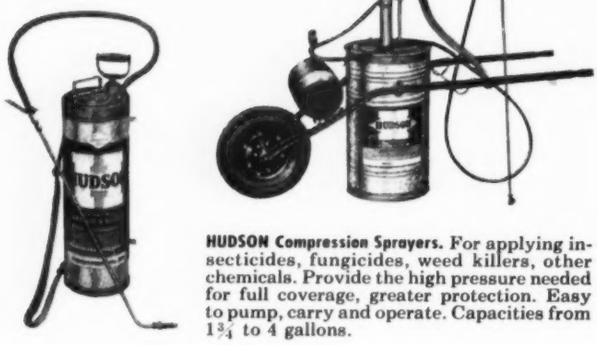
KELVIN CONSTRUCTION CO. LTD.
KELVIN WORKS, LOCHBURN RD., GLASGOW, SCOTLAND
Telephone: Maryhill 1192 *Telegrams: "Prevailing" Glasgow*

STOP PESTS

Control Insects and Weeds the Easy, Effective Way

HUDSON Knapsack Sprayer. Continuous high pressure spraying for farms, gardens, vineyards and insect control. Multi-purpose, easy to fill, easy to operate, comfortable to carry, shaped to fit your back. Positive mechanical agitation.

HUDSON Wheelbarrow Sprayers. Fine, strong, mobile sprayers with ample pressure for any sprayable material—even concentrated emulsions or solutions—for all farm uses. Hand-operated, easy pumping, positive mechanical agitation. Steel, cushion or pneumatic tires.



HUDSON Compression Sprayers. For applying insecticides, fungicides, weed killers, other chemicals. Provide the high pressure needed for full coverage, greater protection. Easy to pump, carry and operate. Capacities from 1¾ to 4 gallons.

HUDSON SPRAYERS

Why let insects and weeds rob you of a good part of your crops? Why let insects spread sickness among your animals?

Both insects and weeds are easily controlled when the right spray is used in the right sprayer. HUDSON sprayers assure correct application of chemicals, save work, conserve materials. HUDSON sprayers drive chemicals into the hearts of plants, shrubs, trees—assure full coverage and maximum protection. Ruggedly built of fine materials they give long service at low maintenance expense.

Whatever your need—there's a HUDSON sprayer that will do the job better, faster and easier. Let your HUDSON dealer help you select the model you need, or write us today for complete information.

Department W-10

H. D. HUDSON MANUFACTURING COMPANY

589 East Illinois Street, Chicago 11, U. S. A.

Many other Sprayers and Dusters for every need

UNICROP

fights weeds

pests

fungus

with advice

Our advisory service is staffed by agronomists who really understand the difficulties you farmers and growers have to face and as all their laboratory findings are tested in the field you will appreciate that the advice they give is accordingly practical. Whenever you have a crop protection problem, do not hesitate to write for our advice.

chemicals

Almost all the enemies that crops are exposed to may be combated economically with Unicrop insecticides, fungicides and weed-killers. We will be pleased to send you a complete list of these chemicals. Leaflets devoted to individual chemicals, their use and characteristics, are also available. (Please state if you would like us to send you any literature we may produce in the future dealing with your particular crop protection problems.)

and equipment

Unicrop machines have been designed by our agricultural engineers only after very thorough consultation with research stations, farmers and growers. In consequence they are robustly constructed, simple to operate and simply maintained. They are based on principles that allow powders and liquids to be spread further and with greater coverage than has thitherto been possible.

Modern agricultural science has given farmers a number of new chemicals that deal with crop enemies in a way little short of miraculous.

But to secure effective results **economically** these chemicals require careful selection and application. Differences of climate and terrain, the type and condition of crops and other factors all need consideration. It's not possible to state on a drum label or even in a leaflet—other than very generally what chemicals most suit **your** particular requirements nor how to apply them best. For this you need the **individual** advice of our experienced agronomists . . which is freely at your disposal.

UNIVERSAL CROP PROTECTION LTD

22 Marshgate Lane
Stratford, London, E.15

Tel: Maryland 4577
Cables: Unicrop, London

Why users choose Caterpillar Motor Graders

Caterpillar Motor Graders are BUILT!

Other makes are assembled from many different sources. Caterpillar designs and builds the engine, transmission, final drive, power controls, frame, circle and drawbar and blade mechanism.

Caterpillar Motor Graders are BALANCED!

Each size of Caterpillar Motor Grader is properly designed and balanced between engine horsepower, weight and working speeds. Proper balance results in higher production and lower operating cost.

Caterpillar Motor Graders are LONG LIVED!

99% of all the Caterpillar Motor Graders ever built are still at work. Quality materials, design and manufacture are still paying dividends to owners . . . in some cases even after 22 years of useful work!

Caterpillar Motor Graders are VERSATILE!

Besides their ability to handle the toughest job expected of a good motor grader, these machines can also be fitted with the following attachments:

- *DoMor Elevating Grader*
- *DoMor Road Widener*
- *DoMor Snow Blower*
- *Scarifier*
- *Snow Plow and Wings*
- *Bulldozer Blade*

Caterpillar Dealers give good SERVICE!

Your Caterpillar Dealer's most important function is the servicing of Caterpillar equipment in his area.

You can be sure of adequate supplies of replacement parts and expert mechanical service when you buy a Caterpillar Motor Grader.

Caterpillar, Peoria, Illinois, U. S. A.

CATERPILLAR

REGISTERED TRADE MARK

DIESEL ENGINES
TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

***And NOW** is the time to buy, because your Caterpillar Dealer can make prompt delivery on all models . . . 50, 75 or 100 horsepower.*

Illustrated is the new "Globe" Disc Plough

VISIT OUR STAND No. 76 at the SMITHFIELD SHOW

SALOPIAN

DISC PLOUGHS

Ploughing rough land calls for a machine that will withstand great stress and strain. Salopian Disc Ploughs, with their exceptional strength and reliability, are built for the really tough jobs—breaking the heaviest land, chopping stubborn roots, and giving wide deep furrows in *any* soil conditions. There's a Salopian Plough to match up to every requirement, and illustrated literature on the complete "Classic" and "Globe" series of Disc Ploughs, and the Polydisc, will gladly be sent on request.

SALOPIAN ENGINEERS LTD., PREES, SHROPSHIRE. Telephone: **PREES 331-4**

Manufacturers of Pick-up Balers . Crop Collectors . Manure Spreaders . Disc Ploughs Farm Buildings . Cowhouse Equipment, etc.

EDECO

REGD.

BEAM TYPE
HAND PUMP

Catalogue 79

ENGLISH DRILLING EQUIPMENT CO. LTD.

BILBAO HOUSE · NEW BROAD STREET
LONDON EC2

Phone: London Wall 4941-4 **Grams: Bullwheel, Ave., London**

This pump is eminently suitable for use in bore holes yielding comparatively small quantities of water for domestic or animal consumption where the rest water level is below suction depth.

The following figures are given as an approximate guide to the yields that may be expected:

DEPTH (HEAD)	PUMP DIAMETER	FIXED STROKE	APPROX. STROKES/MIN.	GALLONS PER MIN.
150′	1¾″	8″	40	2.7
100′	2¼″	8″	40	4.5
75′	2¾″	8″	40	6.2
50′	3¼″	8″	40	9.5

SUBSIDIARY COMPANIES

EDECO PROSPECTORS LTD. EDECO (TRINIDAD) LTD.
EDECO CANADA LTD. EDECO GERMANY G.M.B.H.

SWINGFOG

An efficient and inexpensive fog generator, designed for easy and economical operation

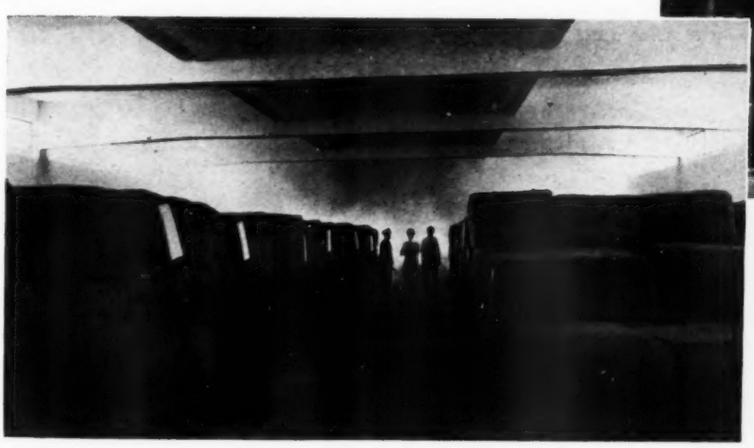
Controlling pests in woods

Weighs only 24.21 lbs. empty, 34 lbs. charged.

Requires only 1.8 pints fuel per hour, uses 2 gallons of insecticide per hour.

Produces approximately seven or eight thousand cubic feet of fog per minute.

Palm Trees
Coconut Pest Research Station, Zanzibar



Warehouse

Portable, minimum maintenance, reliable, economical.

Approved formulations are obtainable from leading insecticide manufacturers.

Available through sole distributors appointed in most parts of the world, or through

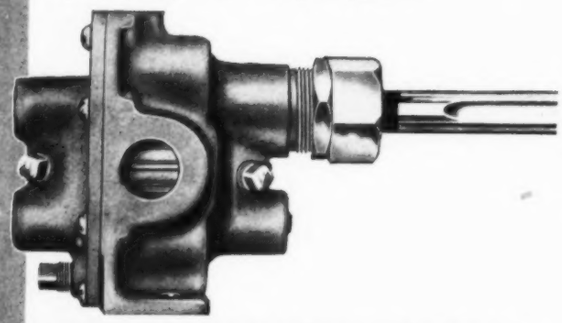
swingfog

SWINGFIRE LIMITED

25 CAXTON STREET · LONDON S.W.1 · ENGLAND

TELEPHONE: ABBEY 7276/7/8 CABLES: SWIBOFIR, LONDON CODE: ACME

LOOK AT THE FACTS



WHEN YOU BUY A SPRAY PUMP

1. WHO MAKES IT? Oberdorfer has been building pumps by the million since 1897. Many of our mistakes are behind us.

2. WHAT IS IT MADE OF? Bronze has always been the basic material of construction for Oberdorfer Pumps. It is highly resistant to the corrosive action of water and most of the spray formulations currently used.

3. HOW DOES IT OPERATE? With but two moving parts (the gears) the liquid is drawn into the pump by suction, travels between the gear teeth around the outside of the pump case and must be discharged in exactly the same quantity for every complete rotation of the drive shaft. It is a metering pump by principle.

4. HOW MUCH DOES IT COST? One pump should spray several thousand acres, so its cost per acre is a fraction of a cent. (List prices $13.25 to $29.00.)

5. HOW ABOUT PRESSURE? High pressure spraying (above 100 lbs. per square inch) is ordinarily the recommendation of high pressure selling. Practical spray nozzle designs generally in use do not require above 100 p.s.i.

6. CAN CATTLE BE SPRAYED AT 100 P.S.I.? Yes, with the addition of one of the many available penetrants (wetting agents) to the spray solution less than 100 p.s.i. is effective for control of most common cattle parasites.

7. IS ONE PUMP SUITABLE FOR ALL AGRICULTURAL SPRAYING EVERYWHERE? No. Oberdorfer makes 300 styles and sizes for all agricultural spraying purposes throughout the world.

8. WHERE CAN YOU BUY THEM? Our distribution is world-wide. Write for nearest distributor.

OBERDORFER

BRONZE SPRAYING PUMPS

AGRICULTURAL PUMP DIVISION
Oberdorfer Foundries, Inc.
17312 Thompson Rd., Syracuse, N. Y.

FUMITE REGD.

PURE LINDANE

non-tainting smoke insecticide protects ALL STORED CROPS

LINDANE IS THE PURE, ODOURLESS GAMMA ISOMER OF BENZENE HEXACHLORIDE (BHC)

The new FUMITE LINDANE is deadly efficient against all types of insect pests in every kind of building, vehicle, aircraft and ship's hold. Foodstuffs in bulk, bags, boxes or original containers may be treated at recommended dosage, in situ, without fear of tainting. FUMITE LINDANE'S amazing efficiency, ease of application, and low cost make it the pre-eminent smoke insecticide. Available in four Pellet sizes. No expensive apparatus required.
FUMITE LINDANE and DDT/LINDANE are permitted at recommended dosage in Bonded Tobacco Stores.

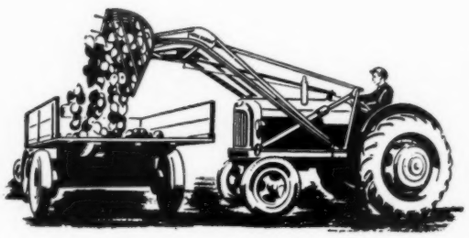
FUMITE range : FUMITE LINDANE, FUMITE DDT/LINDANE, FUMITE AZOBENZENE

British Patent Nos. 621732, 621894 and 651684, other patents pending

Agents in most countries of the world

Trade enquiries to the Sole Manufacturers

WAECO LTD (FUMITE Division)
120/2 VICTORIA STREET, LONDON, S.W.1
Telephone : Tate Gallery 9626 *FACTORY : HIGH POST, SALISBURY, WILTS.*



Beet harvesting?

Beet harvesting time is Horn-draulic time—with the Root Crop Bucket you can save costly hours of back-breaking work when loading beet or mangels. Each tine has a round nose to prevent damage to the crops. Quickly changeable implements include the Seligman Grab for silage handling etc. and Dirt Bucket (capacity 9 cu. ft.) for heavy digging and clearing.

It's time to get a

Horn-draulic

LOADER

The approved loader for David Brown, New Fordson Major, Nuffield, Turner and Farmall M, B.M. and B.M.D. Tractors. Also for use with Fordson Major (Old Model), Ferguson and Allis Chalmers.

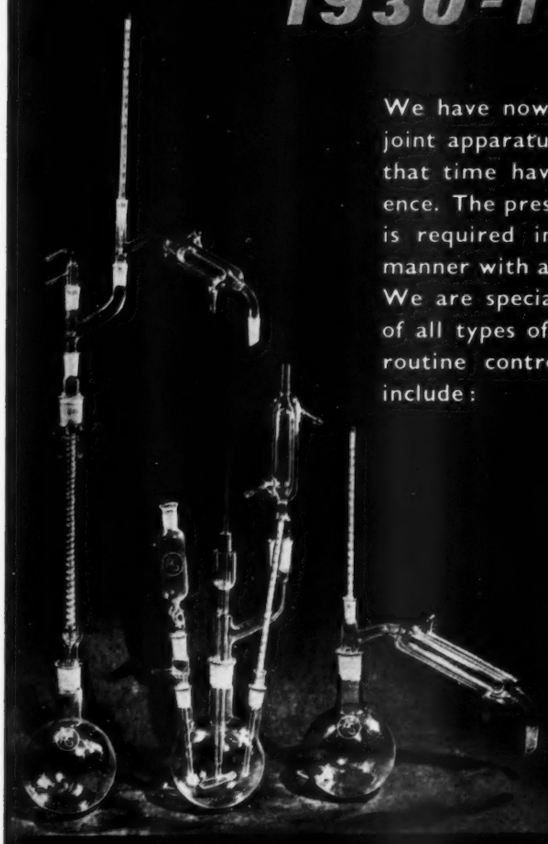
STEEL FABRICATORS (CARDIFF) LTD., ROATH, CARDIFF. Phone: 44436
Export enquiries to: STEEL FABRICATORS (OVERSEAS) LTD.
7 CHESTERFIELD GARDENS, LONDON, W.1

M-W.78

Gallenkamp
REG'D.

AG
Regd

STANDARD JOINT GLASSWARE 1930-1953



We have now been manufacturing standard joint apparatus for over 20 years and during that time have accumulated a wide experience. The present series will perform all that is required in a versatile and satisfactory manner with a minimum use of adapters.
We are specialists in the design and fitting of all types of laboratories for research and routine control purposes. Our specialities include:

Sintered Filtration Apparatus
Volumetric Glassware
Microchemical Apparatus
Furnaces
Ovens
Incubators
Laboratory Apparatus to British Standard Specifications

A. GALLENKAMP & CO. LTD.
17-29 SUN STREET, LONDON, E.C.2
Telephone: BIShopsgate 0651 (9 lines)
Telegrams: Gallenkamp Ave., London

STANHAY SEED SPACING DRILL

(Patents applied for)

- At precision root drill competition 1953 organised by the Sugar Beet Research and Education Committee the Stanhay drill was awarded the highest prize.
- Precision seeding ensures economy in subsequent crop labour, gives stronger plants — better crops at lower costs.

Inspect Unit on Stand 135 (Stanhay Limited) Smithfield Show and be convinced that Stanhay Spacing Drill —

(1) Does not damage seed

(2) Seeds do not roll in the furrow, because

(a) they are discharged at ground level.

(b) seeding mechanism moves in the opposite direction to that travelled by the machine.

(3) Simple change of rubber belt will enable machine to sow a great variety of seeds at spacings required — singly or in groups.

TELL US YOUR SEEDING PROBLEMS

S. BERENDSEN LTD

125 PALL MALL · LONDON SW1

Tel: Trafalgar 6770, 3536-7. Cables: Berendsen, London

FOR LASTING SERVICE

UNDER ALL CONDITIONS

Wolseley water-cooled Engines, Type W.D. 1¼/3 h.p. (illustrated) and Type W.L.B. 2/5 h.p. Renowned for length of reliable service and easy running. Supplied for operation on petrol or petrol/paraffin. All parts automatically lubricated and totally enclosed.

PETROL—PARAFFIN ENGINES

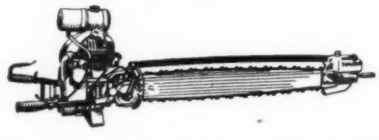
THE WOLSELEY SHEEP SHEARING MACHINE CO. LTD., WITTON, BIRMINGHAM 6 ENGLAND.

The new Patented

Now fitted as standard to the "Tornado" one-man and Danarm "two-man" saws —

Now that the patented Danarm-Oregon Chippet Chain is a standard fitting to all Danarm One-man and Two-man saws, the many advantages of this outstanding chain are available to all. Chromium plated hollow-ground cutters give even faster, smoother cutting of soft or hard timber; equally fast for ripping and cross-cutting. Moreover, this chain can be sharpened with an ordinary round file *in a third of the usual time.*

Descriptive literature of Danarm saws and chains available on request.



J. CLUBLEY ARMSTRONG DANARM LTD.

ABFORD HOUSE, WILTON ROAD, LONDON, S.W.1

A Canteen at Kidderpore, India.

Estate House, Mauritius.

Office Building, Trinidad.

Jos Market, Nigeria, West Africa.

Best in Every Way. . .

Economy

Adaptability

Ease of Erection

Ease of Transport

"Arcon" structures are designed and manufactured to specifications that ensure that the finished building is capable of fulfilling your most exacting local requirements. They are easily transported and quickly erected by unskilled labour. Already they are giving good service in seventy-five different countries. Why not ask your local representative for fuller details?

ARCON ***STRUCTURES***

TAYLOR WOODROW (Building Exports) LTD
LONDON · ENGLAND

Local representatives in most countries, including:–

ANTIGUA	*Geo. W. Bennett Bryson & Co. Ltd., St. John's*
AUSTRALIA	*The Utility Buildings Pty. Ltd., Perth*
BAHAMAS	*Barnes, Penfold & Partners, Nassau*
BARBADOS	*The Central Foundry Ltd., Bridgetown*
BELGIAN CONGO	*Lloyds Trading (Congo) Co., S.C.R.L. Leon Bregy, Esq., Costermansville*
BELGIUM	*Lloyds Trading (Congo) Co., S.C.R.L., Brussels*
BERMUDA	*Pearman, Watlington & Co., Hamilton*
BOLIVIA	*Del Prado & Cia. Ltd., La Plaz*
BRITISH GUIANA	*Sandbach, Parker & Co. Ltd., Georgetown*
BRITISH HONDURAS	*Hofius & Hildebrandt, Belize*
BURMA	*The Imperial Chemical Industries (Export) Ltd., Rangoon*
CEYLON	*The Premier Motors Ltd., Colombo*
COLOMBIA	*J. C. Boulianne, Esq., Barranquilla: Laurence & Co., Cali: Transoceanica, S.A., Bogota*
COSTA RICA	*Jorge Lacayo & Sons (Sucs.) Ltd., San Jose*
CUBA	*Armando J. Yaldes & Cia., Havana*
DOMINICAN REPUBLIC	*The Caribbean Motors Co., C. por A., Cuidad Trujillo*
EAST AFRICA	*Greenham (East Africa) Ltd., Kenya, Uganda & Tanganyika*
EGYPT	*The Imperial Chemical Industries (Egypt) S.A. Cairo*
FIJI ISLANDS	*The Fiji Trading Co. Ltd., Suva*
FRANCE	*Arindus, Neuilly-sur-Seine*
FRENCH SOMALILAND	*Compagnie Generale de l'Est Africain, Djibouti*
GRENADA	*Geo. F. Huggins & Co. (Grenada) Ltd., St. George's*
GUATEMALA	*R. T. Serrano, Junr. Esq., Guatemala City*
HAITI	*The H. R. Tippenhauer Co., Port-au-Prince*
INDIA	*Stewarts & Lloyds of India Ltd., Calcutta*
INDOCHINA	*Landis, Bros. & Co., Inc., Saigon*
INDONESIA	*The International Tractor & Equipment Co., Djakarta*
IRAN	*Fracomia & Co. Ltd., Teheran*
IRAQ	*Stephen Lynch & Co. Ltd., Baghdad*
JAMAICA	*Reginald Aitken Ltd., Kingston*
MALAYA	*E. Ott & Co. (Malaya) Ltd., Kuala Lumpur*
MAURITIUS	*Harel Mallac & Cie., Port Louis*
MOZAMBIQUE	*E.C.S.A.L. Lourence Marques*
NETHERLANDS WEST INDIES	*Prospero Baiz & Co. Inc., Curacao*
NEW ZEALAND	*Stewarts & Lloyds of New Zealand, Wellington*
NICARAGUA	*D. R. Ballantyne, Esq., Managua*
NIGERIA	*Taylor Woodrow (Building Exports) Ltd., Lagos*
NORWAY & SWEDEN	*Herr Walter Magnus, Oslo*
PAKISTAN	*Gladstone, Wyllie & Co. Ltd., Chittagong Steel Bros. & Co. Ltd., Karachi*
PARAGUAY	*Irvine & Ray, Asuncion*
PERSIAN GULF	*The Rezayat Trading Co., Kuwait*
PERU	*William, Barnett & Co., Lima*
PORTUGAL	*Messrs. Strol, Lisbon*
ST. KITTS	*J. W. Thurston & Co. Ltd., Basseterre*
ST. LUCIA	*Minvielle & Chastanet Ltd., Castries*
ST. VINCENT	*John H. Hazell, Sons & Co. Ltd.*
SOUTH AFRICA	*The Imperial Chemical Industries (South Africa) Ltd., Capetown*
SAUDI ARABIA	*E. A. Juffali & Bros., Jeddah*
TRINIDAD	*Alstons Ltd., Port-of-Spain & San Fernando*
TURKEY	*Said Akinci ve Said Dormen, Istanbul*

TX1

When its a CRUSHING & GRINDING PROBLEM Consult

We've solved many problems in our time and it might well be that some problem quite similar to yours has already been examined in our laboratory or in actual field use. Our research and development organisation is always at industry's service, ready at any time to tackle your job.

J. HARRISON CARTER

offer a wide range of

CRUSHERS

GRINDERS

MIXERS

DISINTEGRATORS

EDGE RUNNER MILLS

Machinery for manufacturers of:

Agricultural Chemicals, Bone Meal Bone Flour, Milling, Animal Feed

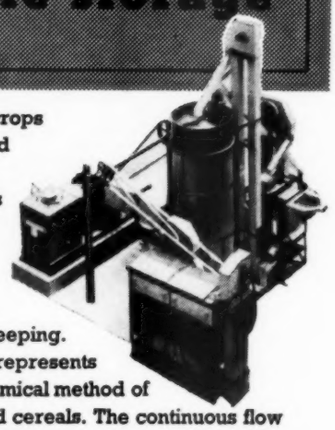
J. Harrison Carter Ltd

DUNSTABLE · BEDS · ENGLAND

TELEPHONE: DUNSTABLE 1191/2

CROPS

and safe storage



Cereal, rice and sorghum crops frequently have to be stored for considerable periods. Suitably damp proofed silos or chambers alone are not sufficient to ensure safe storage. Grain and rice must be thoroughly and evenly dried for safe keeping. The "Lincoln" Grain Drier represents the most effective and economical method of drying all types of grain and cereals. The continuous flow system which it so successfully incorporates results in the even drying of every grain. Write for further details to:—

P and P

PENNEY & PORTER LTD

Riverside Works

LINCOLN · ENGLAND

Chase CLOCHES

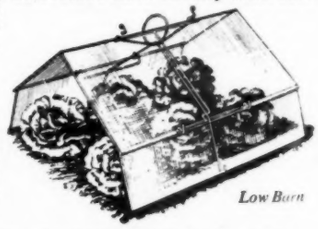
SOON REPAY COST IN CROPS SAVED

Many crop dangers from drenching rain, fierce gales, sudden frosts, bird and animal marauders are overcome by using Chase Cloches. Remember also that these Cloches double and treble your output, speed up growing time by three to six weeks, provide matchless quality vegetables, fruits and flowers early for ready sale at top prices or for home use cheaply while shop prices for equal quality are at their peak.

TURN CROP LOSSES TO PROFIT

No better evidence that Cloches do fulfil the claims we make for them than the fact that nearly 20,000,000 have already been sold. The earlier you install Cloches the more profitable your gardening will assuredly be.

The Chase Low Barn is the most useful Cloche on the market
Pack of 8 (16*ft. run*) £3 - 12 - 6
Case of 30 (60*ft. run*) £12 - 15 - 0



Low Barn

•

SPECIAL PRICES FOR COMMERCIAL GROWERS
EASY PAYMENT TERMS

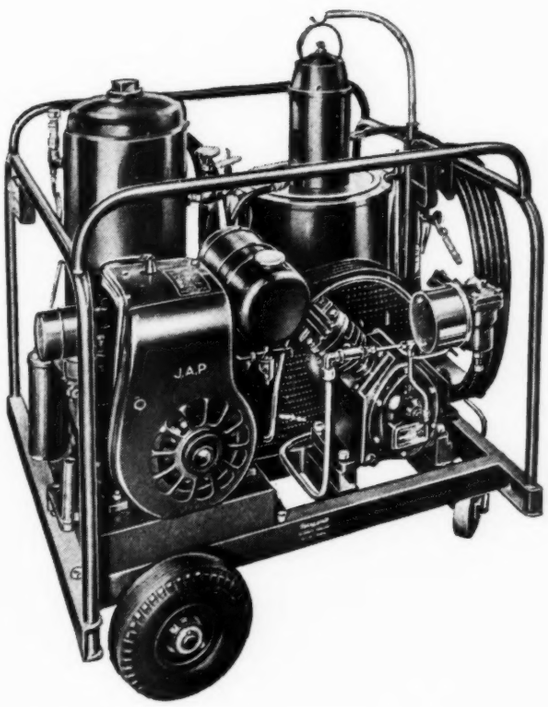
•

CHASE PROTECTED CULTIVATION LTD

49 CLOCHE HOUSE · SHEPPERTON · SURREY · ENG.

Routine maintenance jobs cost you more than the servicing charges! They cost you the time wasted while your tractors and machinery are in the service bay, waiting their turn for attention. By servicing your equipment on the spot you can save those lost hours, lost opportunities for improving your yield.

Own the new Tecalemit "Tectruk" Servicing Unit!



The "TECTRUK" Servicing Unit with units powered by a petrol driven J.A.P. model 4/3 engine. Electrically powered model also available.

SAVE MORE THAN HALF THE MONEY AND TIME SPENT ON ROUTINE MACHINERY SERVICING

With the "Tectruk" your men can carry out routine lubrication and servicing jobs on the spot faster and cheaper and just as efficiently as in the service bay. In most cases, the time and labour charges saved by "Tectruk" servicing will amount to 50 per cent or more of the usual cost of maintenance.

WHAT THE "TECTRUK" WILL DO FOR YOU

On the "Tectruk's" sturdy steel chassis are mounted an air-operated drum pump complete with hose and control valve, a penetrating oil sprayer, a tyre inflator, and a two-stage air compressor.

The drum pump unit gives the power for efficient high pressure lubrication. The spring sprayer attends to the springs and similar exposed lubrication jobs. The air compressor can be used for tyre inflation and plug cleaning, for paint spraying on both buildings and vehicles, for spraying insecticides and weed-killer, and for operating pneumatic tools.

EXTRA PROFIT

"Tectruk" servicing enables you to cut down idle time, to get more out of your equipment every month. From the regular, extra profit it brings you, the "Tectruk" will soon pay back its low initial cost!

Ask your usual Tecalemit distributor for further details, or write to:

TECALEMIT LIMITED
GREAT WEST ROAD · BRENTFORD · ENGLAND

T460

Heavy job? — the Fordson Major has the 'six-gear' power to do it at speed and make it pay. Light job? — the Major's wonderfully economical engine uses just enough fuel — no more — for the load in hand. That way, the Major gives you an all round economy that saves you money on every task. Added to this the Major's 'hill-hugging' stability and 'short-turn' steering enables it to tackle the toughest farming land. You can use a Major on *more* jobs — that's why it saves you money *more* days every year! Get all the facts about the *Money Making* Fordson Major from your Ford Dealer.

D DIESEL
P PETROL
V VAPORISING OIL

FORDSON MAJOR

MAJOR FARMING LEADS IN VALUE

A FORD PRODUCT · MADE IN ENGLAND

THIS 'LITTLE' TRACTOR
does a man-size job

Illustrated here is the Bristol 22 pulling a 3-furrow Ransome Midtrac Plough *8" deep × 12½"* wide in 12 lb. soil, a sustained drawbarpull of 3,600 lbs.

Over 4,000 lbs. drawbarpull . . . independent clutch steering, for full power pivot turns . . . extra long track for stability on all gradients. Choice of 11 gauges 30" to 55". Diesel engine (Perkins P. 3), *or* V.O. *or* Petrol (Austin). Electric starting and lighting and full range of mounted implements (hydraulic) are among the optional extras.

BRISTOL 22
IN USE ALL OVER THE WORLD

Prices from **£621** *Ex Works*

BRISTOL TRACTORS LTD. Soughbridge, Earby, via Colne, Lancashire

---

MANY Crops are better cultivated by ONE implement

THE HOWARD ROTAVATOR

ROTARY HOES LIMITED, HORNDON, ESSEX, ENGLAND · CABLES: "ROTOVATE, BRENTWOOD"

FOR ALL CONDITIONS AND ALL CROPS

Leaders in the field of agriculture for more than 160 years, Ransomes are makers of ploughs and other machinery which can be relied upon for many years of reliable service. Ploughs range from those suitable for the small Ransomes MG Crawler Tractor to giants weighing more than 3 tons, and there are numerous other implements including cultivators, subsoilers, ridgers, disc harrows, etc. for all crops, soils and conditions.

The illustrations show :—

(**Top**) The C.65 cultivator designed for working to depths up to 9 ins. and available with 7, 9 or 11 tines.

(**Right**) One of our many mounted ploughs, specially designed for direct coupling to tractors fitted with hydraulic lift and 3-point linkage.

Illustrated literature and all information will be sent on application. Agents in most countries

Ransomes

Other Ransomes products include maize and seed shellers, peanut pickers and shellers, thrashing machinery for wheat rice, etc., balers and crop driers.

RANSOMES SIMS & JEFFERIES LTD. • IPSWICH • ENGLAND

DRON-WAL *Supreme and* SPRAYERS SYRINGES

KNAPSACK SPRAYERS

No. 1 (Pat. No. 626777) with patent cam action pump, easy to operate diaphragm pump, less working parts than any other and less spare parts required.

Catalogues and full particulars of all the lines we make on request.

No. 8 'Easi-Fill' Pneumatic Sprayer. All brass container, strongly made with Trigger Release, Brass Lance and very fine spray Nozzle, with shoulder strap for carrying. In 1½, 2½ and 3½ gallon working capacity sizes.

The PHILIP B. WALDRON CO., Kings Road, Tyseley, BIRMINGHAM 11

HYDRO-CLAM

DIGS STRAIGHT DOWN!

Ideal for digging spot excavations

Hydraulic pressure on both halves of the clam provide clean, fast digging . . . it literally 'bites' a jaw full of earth (almost ¾-yard) and lifts it effortlessly to a waiting truck. All four corners are square and neat.

FEATURES :

Tremendous loading ability — 4½ tons closing pressure on clam ● Maximum digging depth of 8½ ft. ● Adjustable side outriggers for sloping ground and extraordinary stability ● Self-levelling clam assembly retains ½-yard load raising to dumping height clearance of 7½ ft. ● 12 ft. reach behind main frame with 150° operating arc for digging and dumping ● Clam assembly can be locked for operation as a backhoe ● Clam method of digging practically eliminates severe strain on main frame and tractor ● Removes from tractor in less than 15 minutes ● Will dig excavation from side when obstructions prevent end digging.

SEND FOR FREE LITERATURE

Exclusive Export Distributor

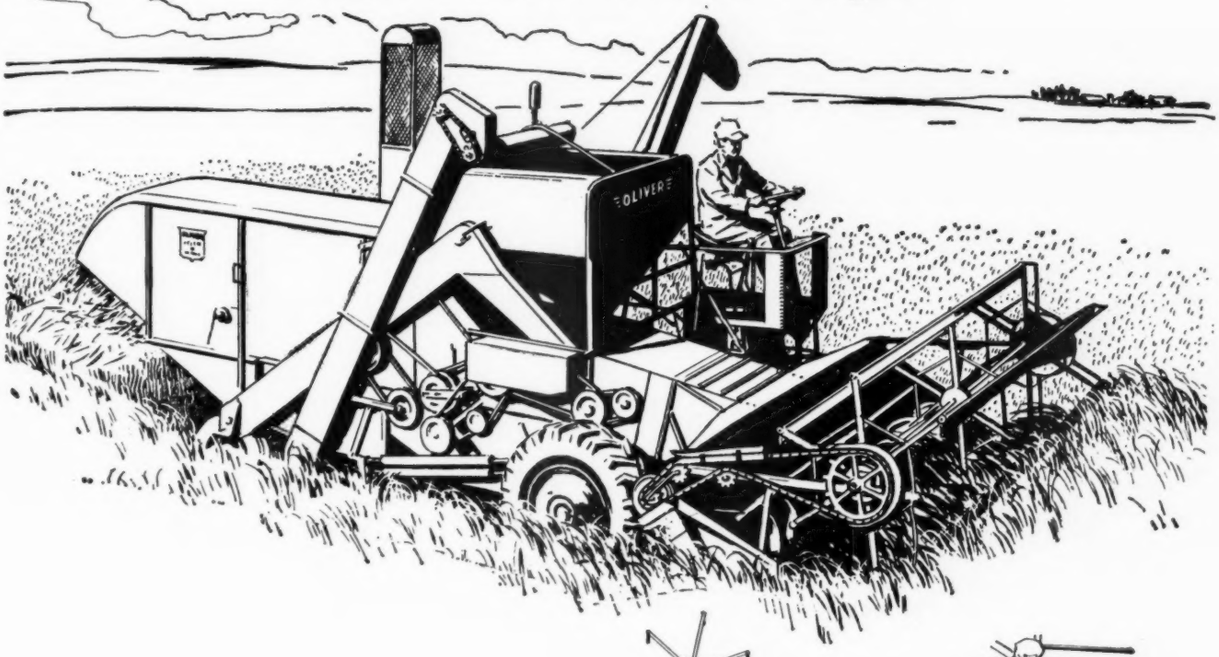
HENRY R. JAHN & SONS, INC.

7 Water Street, New York 4, New York

Manufactured by SHAWNEE MANUFACTURING COMPANY, INC.
1947-00 North Topeka. Topeka. Kansas. U.S.A.

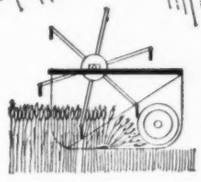
OLIVER Self-Propelled Combine

Handles the Heaviest Crops!

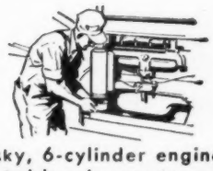


Heavy, tall crops are harvested easily by the Oliver Model 33 Self-Propelled Combine. There's no chance of clogging. The crop is carried *straight back* to the big threshing cylinder.

Threshing, separating and cleaning units are extra large for handling the heaviest crops. You can keep going day after day without delay. And, the Model 33 is easy to operate. You sit up high, in a comfortable rubber spring seat. Header can be raised or lowered while moving. Attachment for bagging grain is available.

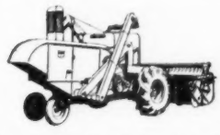


The slats on the semi-revolving reel drop straight down. There's less shattering, less loss of grain. "Down" grain is saved, too.



Husky, 6-cylinder engine, located low, is easy to service. Double clutch provides independent ground and threshing speeds. "Varidraulic" drive gives you *any* ground speed with the push of a button.

Oliver pull-type Model 15 Combine, with 6-foot header and field-proved units that get and save hundreds of seed crops.



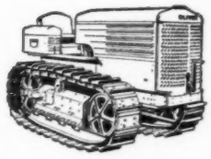
Oliver Ricefield Model 33 Self-Propelled. "Floating" header prevents damage in rough ground. Equipped with special tires and units for harvesting rice.

OLIVER

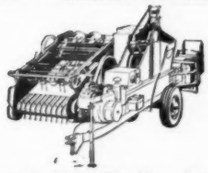
THE OLIVER CORPORATION

Export Division: 400 West Madison Street, Chicago 6, Illinois, U.S.A.

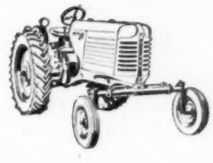
"FINEST IN FARM MACHINERY"



Four Sizes of Farm Crawlers.



Automatic Wire Tie Hay Baler.



Full Line of Wheel Tractors.

The latest developments in Crop Sprayers can be seen on Stand 200. SMITHFIELD SHOW

Of particular Interest

40 gallon tank and 22 ft. 6in. boom arranged for mounting on the power lift of your Tractor. The design is pleasing—the price surprising.

Please write for illustrated folder.

DORMAN SPRAYER CO. LTD.

THE DORMAN SPRAYER CO. LTD., 408 CHERRY HINTON ROAD, CAMBRIDGE · Tel: Cambridge 87385

AFFORESTATION

"Since it is certain and demonstrable that all arts and artisans whatsoever must fail and cease if there were no wood in a nation (for he that shall take his pen and begin to set down what art, mystery, or trade belonging any way to human life could be maintained and exercised without wood will quickly find that I speak no paradox). I say when this shall be well considered, it will appear that we had better be without gold than without timber."—Extract from Evelyn's "Sylva."

The above, though written over 280 years ago, applies more today

Replant those felled areas NOW

Let us quote prices for

Forest Tree Seed, Seedling and Transplants, in the leading varieties, also ornamental Trees, Fruit Trees and Shrubs

Tree Catalogue on request Seed Catalogue issued in February Correspondence invited

D. MELDRUM & SONS

THE FOREST TREE NURSERIES, FORFAR, SCOTLAND

TELEPHONE: 565 FORFAR TELEGRAMS: 565 FORFAR

AGRICULTURAL ENGINEERS ASSOCIATION

(HOME AND EXPORT DIVISIONS)

President: CAPTAIN E. N. GRIFFITH

Director: DR. JOHN RENNY

The Association has taken over the activities of the British Agricultural Machinery Manufacturers' Export Association (B.A.M.M.E.X.), which has been dissolved. All functions, duties and endeavours of this former organisation will be carried out by the Association's own Export Division under the personal supervision of the Director assisted by Commander F. D. Bingham acting as Manager of the Division.

The closest liaison is maintained with all Government Departments and the Association can be looked on as being officially recognised as the trade's most effective home and export organisation. It has the closest relations both with foreign embassies and Dominion and Colonial Offices. The Export Division can investigate members' problems, and wherever possible will find a solution.

The latest information, technical specifications and manufacturers' literature can be obtained at Dashwood House.

Personal interviews can always be arranged

THE AGRICULTURAL ENGINEERS ASSOCIATION

(Home and Export Divisions)

222-227 Dashwood House, 69 Old Broad Street, London, E.C.2, England

Telegrams: LONdon Wall 6922. Cables: Bammex, London

• big economies in
• copper and
• sulphur

new ways with bordeaux mixtures, etc.

Late blight of potatoes can be controlled with organo-mercury compounds alone. At the same time there are many troubles where an organo-mercury may be a co-partner in, for instance, bordeaux mixtures or sulphur preparations — improving the fungicidal power and offering a big economy, since the equivalent of 1 lb. of mercury will save 75 to 100 lbs. of copper or 100 to 200 lbs. of sulphur. This new technique with old friends appears to have big possibilities and we shall be happy to advise.

We also make wettable powders such as D.D.T., Lindane and Sulphur

F. W. BERK & CO. LTD.

THE MERCURY SPECIALISTS

1/19 NEW OXFORD STREET, LONDON, W.C.1

and at Tilgate Research Station, Sussex

TAS/BK.306

Protecting
THE WORLD'S CROPS
Protection from the wastage due to fungus diseases, insect pests and weeds can materially assist the World's need for increased food production. Crops such as wheat, oats, barley, rye, maize, roots, potatoes, sugar cane, tea, coffee and many others can benefit from such protection.
Enquiries will be welcomed for expert attention.
ABAVIT B, RAPHONE, B.S. FUNGICIDE, ABAVIT S, D.D.T. PRODUCTS.
BRITISH SCHERING LTD.
229-231 KENSINGTON HIGH STREET, LONDON, W.8
Agricultural Chemicals

Now in active preparation

CROP PROTECTION

8½in. × 5½in. ILLUSTRATED

This book correlates the achievements of the Chemist and the Engineer, and makes them intelligible to the man in the field. It contains:

1. *A restatement of the principles governing sound crop protection.*
2. *Up-to-date information on the performance and utility of the chemicals and formulation available, and stresses their more specific application.*
3. *Descriptions of the mechanical systems employed in the application of materials.*
4. *A discussion of the problems involved in the choice of formulations and the method of applications.*

This book is written for practical agriculturists throughout the world.

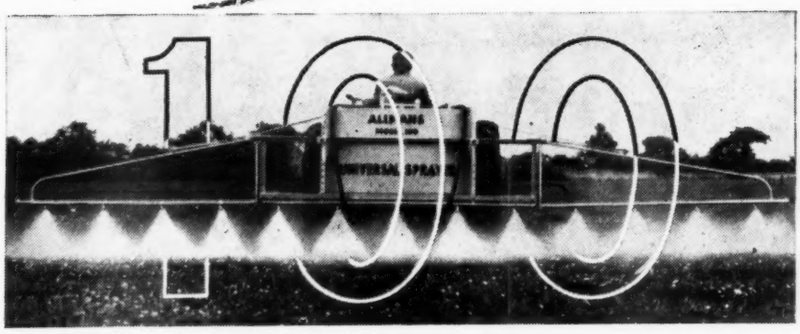
Published by

LEONARD HILL LIMITED

STRATFORD HOUSE, EDEN STREET, LONDON, N.W.1

The Most Advanced Sprayer of the Age

ALLMAN'S UNIVERSAL SPRAYER MODEL 100



Ground Spraying · Fire Fighting · Tree Spraying

★ Spraying widths—20 ft., 30 ft., 48 ft. and 96 ft.

★ Tank. 100 gallon capacity, fully hydraulically mounted.

★ Machine perfectly balanced, weight carried on all four wheels of tractor. Quickly converted to a trailer model.

★ Genimec (Patented) Control giving boom selection, pressure regulation, automatic nozzle cleaning and non-drip shut off.

★ With patented agitation system and many other important features.

The ALLMAN (Tractor Mounted) PESTMASTER DUSTER

Blight, weeds and insects are controlled by this highly efficient dusting Machine. The 200-in. wide boom and 5-row dusting unit is completely controlled from the tractor driving seat. The Patented pre-set control gives money-saving precision dusting. The Pestmaster Duster is the finest of its kind.

GENIMEC SPRAY RIGS

hydraulically mounted

FOR ALL POPULAR MAKES OF TRACTOR

A highly efficient but low-priced machine. The Genimec Single Barrel Rig takes any standard 40-gallon barrel, or standard galvanised honey barrel. The Genimec Twin Rig carries two 40-gallon barrels for spraying larger acreages.

Fitted with the Genimec Patented Fingertip Control.

THE ALLMAN PLANTECTOR

The Allman Plantector High/Low Volume Spayer will operate up to 100 lb. p.s.i., according to the size of the jets being used. It can be fitted by one man in a few minutes and will apply from 2½ gallons up to 75 gallons per acre. Tank 45 gallon capacity.

Conversion sets to enable the Allman Plantector to be interchanged with different makes of tractors can be supplied.

High pressure solvent rubber hose for applying oil sprays is fitted as standard equipment.

Hand lances are available for spraying soft fruit, bush fruit, orchards and plantations. Drop legs for Underleaf spraying supplied extra.

Write for illustrated leaflets giving detailed information of these machines.

E. ALLMAN & CO. LTD.

BIRDHAM ROAD, CHICHESTER, SUSSEX, ENGLAND **Telephone: Birdham 353/4**

EXPORT DIVISION : Allman Overseas Ltd., Bury Court House, Bury Court, London, E.C.3

WE ARE ORIGINATORS OF THE HYDRAULICALLY MOUNTED SPRAYER

The First Complete Account of the Egyptian Cotton Industry

EGYPTIAN COTTON

By

C. H. BROWN, B.Sc.

(Lately Chief Cotton Breeder to the Egyptian Ministry of Agriculture)

With a foreword by SIR RALPH LACEY
Chairman of the Raw Cotton Commission

Demy 8vo. 188 *pages.* *Price 16s., plus postage 6d. U.K., 1s. abroad.*

Contents include:

THE EGYPTIAN BACKGROUND—THE COTTON CROP—COTTON CULTIVATION——PESTS AND DISEASES—THE MINISTRY OF AGRICULTURE—BREEDING—SEED SUPPLIES—TESTING—PAST AND PRESENT VARIETIES—ECONOMICS OF THE INDUSTRY—EGYPTIAN COTTON IN OTHER COUNTRIES.

Cotton is the life blood of Egypt. On the cotton crop the whole population of the country is to a greater or less measure dependent. Moreover, Egyptian cotton includes the longest and finest types of cotton produced in the world, its quality only being surpassed by Sea Island cotton which is grown in small quantities in the West Indies.

The cultivation of cotton in Egypt dates back only to the beginning of the last century and the types of cotton grown probably originated by chance as the result of natural hybridisation. Since the beginning of the 20th century, however, the authorities in Egypt have paid much attention to the improvement of cotton grown there and, thanks to the work of a number of British experts engaged by the Egyptian Government, the industry has expanded and the quality of Egyptian cottons has continued to improve.

Strangely enough, so far no complete account of the Egyptian cotton industry has appeared in book form if we except the works of Dr. Lawrence Balls, which deal with certain technical aspects of breeding and improving Egyptian cotton.

In the present volume this want is supplied. The author, Mr. C. H. Brown, spent many years working in the service of the Egyptian Ministry of Agriculture on the improvement of Egyptian cotton and was among those Englishmen who were forced to give up the valuable research work they were doing because of the political situation. His knowledge of Egyptian cotton is profound and his contribution to research for the improvement of cotton in Egypt is massive.

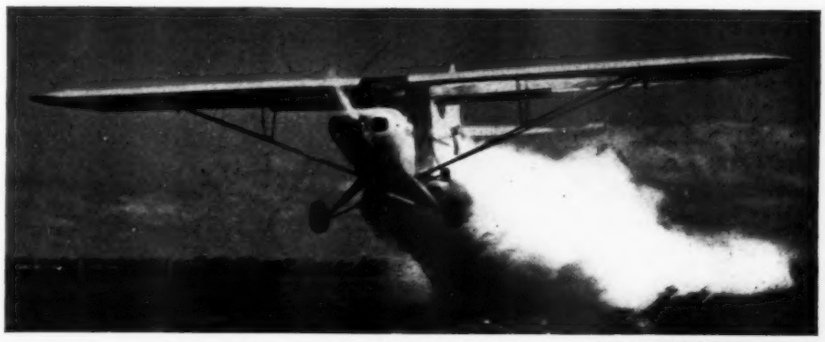
This book contains a comprehensive and readable account of the Egyptian cotton industry, while the author's instructive comments enhance its value. It will be welcomed by all interested in cotton production throughout the world.

Obtainable through your usual bookseller or from the Publishers

LEONARD HILL LIMITED · 9 EDEN STREET · LONDON · N.W.1

PIPER
AGRICULTURAL AVIATION NEWS
PIPER AIRCRAFT CORPORATION, Lock Haven, Penna.

NEW PIPER PA-18-A DUSTER AND SPRAYER ACCLAIMED WORLD-WIDE FOR EFFICIENCY



DUSTER OR SPRAYER. In less than two hours the PA-18-A can be converted from duster to sprayer or vice versa or entire tank can be easily removed to make "quarter-ton truck" or two-place utility airplane.

Many Experienced Operators Switching From Heavier Biplanes

As the Piper PA-18-A proves itself, many large fleet operators who formerly used heavier aircraft of 300 to 450 horsepower are switching to the PA-18-A.

One Phoenix, Arizona operator comments on the PA-18-A's superiority this way: "Low cost of operation, more comfortable, less maintenance, work from shorter fields, less work for pilots, longer working time before fuel stop and many other favorable comparisons such as available parts."

A Dixon, Calif. operator says the PA-18-A puts out "as good or better dust pattern, is more maneuverable, much more economical." While at Miles City, Mont. a PA-18-A owner says his plane "is much better in all respects for our type of work."

Superior application of the PA-18-A is described by a spray concern in Tres Pinos, Calif. who claims the PA-18-A's "slow flight characteristics enable better liquid penetration to foliage.

NOW 15 GALLONS PER ACRE

Much of the success of the PA-18-A has centered on the highly efficient dispersal equipment developed with the cooperation of several agricultural test centers. The venturi has a highly-advanced aerodynamic form to give good dust dispersal side-wise and downward while the wind-driven agitator provides uniform flow.

Liquids can be dispersed at rates ranging from 15 gallons per acre to one-half gallon. A very efficient, heavy-duty pump system provides proper pressure which the pilot can adjust. Positive shut-off control assures accurate coverage.

SEND FOR BROCHURE ON PA-18-A

For full details on the remarkable Piper PA-18-A send today for free brochure to: Piper Aircraft Corp., Lock Haven, Pa., U.S.A., Dept. R-4.

Name.....

Address.....

City.....

Piper Builds Record Number of Planes in 1952 For Chemical Application

After a year in service with agricultural chemical applicators throughout the world, the Piper PA-18-A duster and sprayer has been enthusiastically accepted as ideal for seeding, fertilizing, defoliating, insect and weed control, and the aerial application of chemicals for many other purposes.

Thousands of Pipers in Use

Developed from lessons learned with the thousands of Pipers previously converted to dusters and sprayers, the PA-18-A is the only agricultural airplane in the world now in volume production. It was developed from the famous Piper Super Cub by a special agricultural development division of Piper's engineering department.

Operators all over the world were consulted, their requirements studied. Since then comments and lessons learned in last year's PA-18-A have been incorporated in the new 1953 PA-18-A for even more efficient operation and the most effective dispersal of a wide variety of chemicals at varying coverage per acre.

135 Horsepower Lycoming

With 135 horsepower, the PA-18-A can land and take off where other planes can't operate. High lift flaps give short, heavy-load take offs, slow landings, and excellent downwash for good penetration. A heavy-duty hopper holds 110 gallons of liquid or 18 cubic feet of dust. Dispersal booms for spray or venturi unit for dust are interchangeable giving the plane dual utility. An average swath of 50 feet provides excellent coverage.

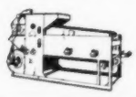
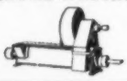
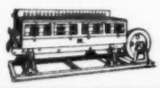
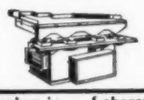
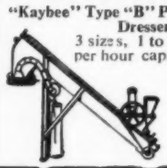
Many Safety Features

Safety features, in addition to the PA-18-A's superb climb and maneuverability, include shoulder-harness and wire cutters on the landing gear. The 135 Lycoming engine sets an unmatched standard for dependability. Maintenance and servicing are kept at a minimum to provide excellent reliability.

In addition to wide use in all sections of the United States, the PA-18-A has been put into service throughout the world controlling plagues and helping improve crop yield.

KAYBEE STANDS FOR MODERN MACHINES

THE MOST COMPREHENSIVE RANGE OF ULTRA MODERN MACHINES FOR THE CLEANING AT ALL STAGES FOR ALL PURPOSES OF CEREALS, PULSES, SEEDS ETC.

FOR GRAIN STORAGE AND HANDLING	"Scientaire" Pneumatic Pre-Cleaner. Capacity 5/6 tons per hour irrespective of moisture content	"Scientaire" Duplex For capacities of 10/15 tons per hour. Low power, small space, high efficiency	"Kaybee 50" 5 machines in one self contained unit 	"Kaybee" General Separator. 4 types. 20 sizes. Capacities 1 to 80 tons per hour
FOR SPECIALISED GRAIN, SEED & PULSE CLEANING	"Kaybee" De-awner, Thrasher, Clipper. Small size, high efficiency and low power. Indispensable for all combine harvested cereals 	"Kaybee" High Capacity Cylinder The modern method of separating by length. Capacities from 500 to 10,000 lbs. per hour	"Kaybee" Table Separator 10 sizes, capacities up to 10 tons per hour. Built in variable speed drive 	"Kaybee" Gravity Separator. The machine with many specialised applications on cereals, pulses, seeds, etc. 
FOR THE FLOUR & PROVENDER MILLER, MERCHANT ETC.	Type "K" Hammer Mill with built on magnetic separator and efficient store trap. Employs new principles	"Kaybee" Type "B" Powder Dresser 3 sizes, 1 to 6 tons per hour capacities 	"Kaybee" Infra-red Moisture Tester. Accuracy with speed. Determinations from 0% - 100% to within ± 0·5 %	"Kaybee" Laboratory Cleaning Plant. 5 separate testing machines; scourer, huller, aspirator, sieve separator, paddy separator, H.C. cylinder

The above are just twelve out of a range of over 100 modern machines specially designed for the cleaning and preparation of all types of cereals, pulses and seeds. Send for full particulars of these or of our complete range of rice, flour, barley, oat and provender milling machines. A complete Seed Testing Laboratory is at your service for testing and investigating your problems.

T. R. WALKER
BILBROUGH, YORK
Phone / Grams: Tadcaster 2166

N.V.C.P. is the sales office of nine independent basic Dutch chemical industries.

From **N.V. Koninklijke Nederlandsche Zoutindustrie** production we supply the

FUNGICIDE KONEPROX,

an excellent copperoxychloride composition.

From **C. T. Stork & Co Chemische Industrie N.V.** production we sell

MONOCHLOROACETICACID and **SODIUM SALT** for the manufacture of selective weed killers.

We shall be glad to submit you our competitive offer.

Nederlandsch Verkoopkantoor voor Chemische Producten N.V.
63 Mauritskade, Amsterdam, Holland, Tel. 54322, Telex 445

London Office: Greyer Brecheisen & Co Ltd., Bush Lane House, Cannon Street, London E.C. 4, Tel. Mansion House 9030 & 2392, Telegr. Oilanchems, London.

BOECC

We are specialists in the export of British agricultural machinery, transport, pumps, diesel engines, generating sets, etc., and represent in various markets, particularly the Middle East and Africa, a number of leading manufacturers, for whom we have secured substantial contracts.

We offer specialised experience to overseas clients wishing to purchase British machinery, and we arrange financing of British machinery exports where necessary.

To British manufacturers, our own overseas organisation ensures energetic sales and thorough service and maintenance facilities.

THE BRITISH OVERSEAS ENGINEERING & CONSTRUCTION CORPORATION LTD
30 QUEEN ANNE'S GATE · LONDON SWI

MAKES RICH HUMUS

from

BAGASSE
BANANA TRASH
STRAW OF ALL TYPES
COCONUT WASTE
MAIZE STALKS
WEEDS

Keep down waste with FERTOSAN — the quickest, simplest and most economical compost maker. The result of years of scientific research, Fertosan is a highly efficient organic preparation which rapidly decomposes all waste vegetation, however tough or stringy, and provides the natural means to increased soil fertility and better crops. Rich humus can be made in 5 to 6 weeks simply by sprinkling Fertosan over the heap—no turning is required. Fertosan Compost Accelerator is available in units to make 1, 4, 20, 60 or 100 tons, or more, of compost.

SPECIAL

For tough, fibrous tropical and semi-tropical crops, a remarkable new accelerator has been developed—FERTOSAN F.1451 Special Accelerator. Full details will gladly be sent on request.

Write TODAY for generous Samples and Terms.

Fertosan Ltd. (Dept. 27), Wolverhampton, England

The doyen of dairying papers, yet the most up-to-date journal on all aspects of dairy science, technology and engineering

DAIRYMAN

Established 1879

- **DAIRYMAN** *is concerned with milk production, handling, processing, manufacturing and distribution*
- **DAIRYMAN** *is international in outlook and contains information from all sources and countries*
- **DAIRYMAN** *is read by scientists, engineers, managers, farmers, consultants, technologists, government officials and many others*
- **DAIRYMAN** *is published monthly and brings to its readers authoritative articles and reports on the latest developments, products, processes, equipment and plant*

Specimen copy on request

DAIRYMAN LIMITED

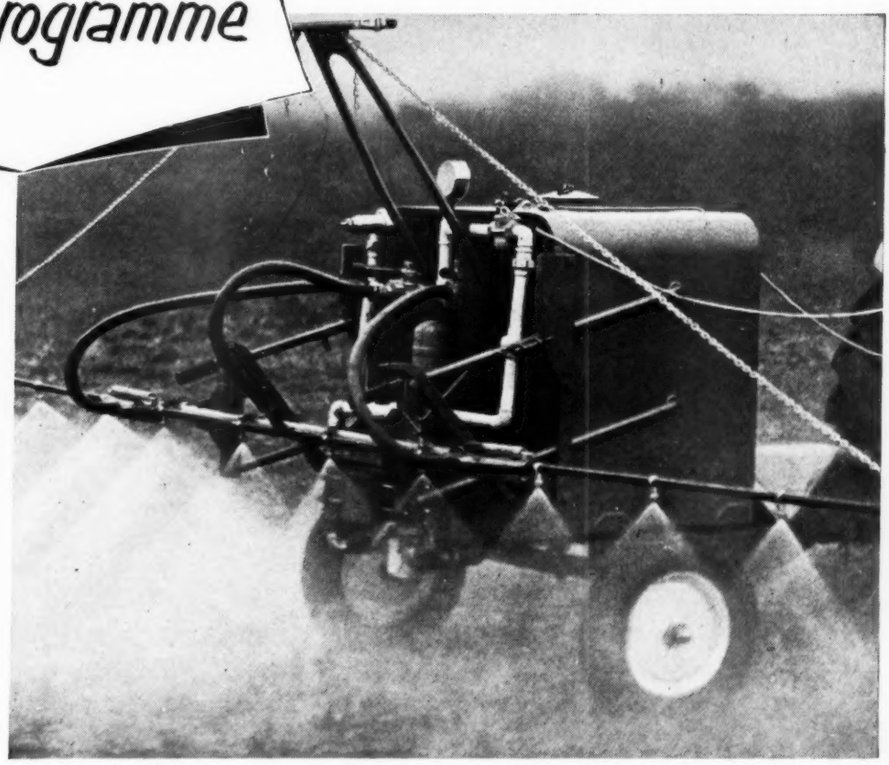
STRATFORD HOUSE, EDEN STREET, LONDON, N.W.1

Subscription Rates: 1 year, £1. 3 years, £2 10s.

BY APPOINTMENT AGRICULTURAL SPRAYING CONTRACTORS TO THE LATE KING GEORGE VI

Now a small P.C.L sprayer that tackles your complete spraying programme

No need any longer to be a large farmer to benefit from tackling a complete spraying programme with your own equipment. Pest Control Ltd. now bring you the Fieldmaster — a 100 gallon high/low volume, trailer type sprayer which is highly versatile and easily operated even by unskilled labour.



The 'Fieldmaster' does all this

Sprays against weeds, insect pests and fungus diseases in corn and grassland, potatoes, vegetables, hops, fruit, vineyards and on tropical crops such as tobacco and cotton. Can be used for high or low volume spraying and can be easily changed over from one to the other.

Registered Trade Mark

What you get in the 'Fieldmaster'

Compare the following design points for yourself. See how well P.C.L. have solved your problem.

1 Highly efficient twin piston-type pump — a rare feature for a medium price machine.
2 Tank internally treated with special corrosion-resisting enamel.
3 Mechanical Agitation.
4 Three-stage filtration.
5 Universal hinge to spray bars.
6 Simplicity of operation.

Write for leaflet from your nearest branch or agent

PEST CONTROL LTD

OF CAMBRIDGE, ENGLAND

B.70

World Copyright

Spraying with Air

Fighting pests in agriculture calls for specialised equipment. Crops, planting methods, ground conditions and climate vary all over the world, and with them the machines which can do the job most successfully.

We have developed a wide range of Micron Sprayers, each one suitable for different conditions. All our machines, however, have one thing in common—Rotary Atomisation. This method of breaking up the spray liquid into very small particles enables economic spraying of high concentrate liquids at very low application rates. Suspensions, emulsions or solutions can be used through the Micron Sprayer and as there are no small openings no blockages will occur. An airblast of 2,000 cu. ft. per minute produced by the Micron Sprayer weighs 150 lbs. and gives the spray as much power and penetration as 15 gallons of water per minute used as diluent in conventional spraying.

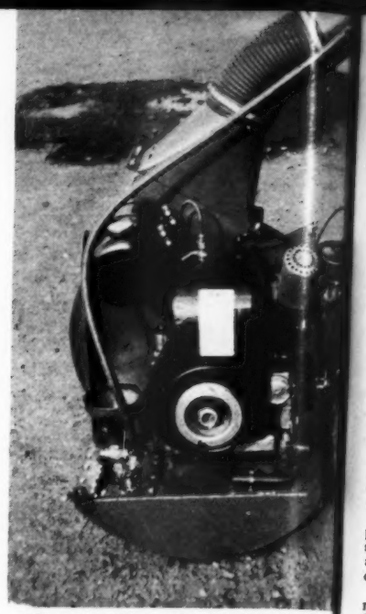
If you have any pests to fight, we would be only too pleased to give you detailed information on, and results achieved with, any of our various models. We feel sure that one of these machines will prove to be the answer to your spraying problem.

●

CLEAN CROPS LIMITED

PALACE CHAMBERS, BRIDGE STREET, LONDON, S.W.1

Telephone : Whitehall 8854 **Cables : Cecemicron London**



Plantation Micron Sprayer for spraying against Oidium

Standard Micron Sprayer for locust control the rate of 3 acres per minute

The Mini-Micron. More efficient and quicker application than knapsack spraying

Rabbit Duster for humane and quick destruction of Rabbits

Orchard Micron Sprayer for applying concentrated sprays at the rate of 5 to 20 gallons

CLASSIFIED ADVERTISEMENTS

WHEN ADDRESSING ENQUIRIES TO THE ADVERTISERS
PLEASE MENTION

Address Box Numbers to:

'WORLD CROPS,' STRATFORD HOUSE, EDEN STREET, LONDON, N.W.1

PUBLIC APPOINTMENTS

HER MAJESTY'S COLONIAL SERVICE

A NUMBER of vacancies exist for AGRICULTURAL OFFICERS in the Colonial territories (at present mainly in East and West Africa and Fiji). Applicants should be between the ages of 25 and 40, of British nationality, with a Degree in Agriculture and not less than two years' post-graduate training or experience in agriculture.

Appointments will normally be on permanent and pensionable terms, but occasionally on contract. Salary scales and allowances vary from one Colonial territory to another. Generous home leave, with free passages for officer and family on first appointment and leave.

For fuller information write to the Director of Recruitment (Colonial Service), Sanctuary Buildings, Great Smith Street. London, S.W.1, quoting reference CDE 68/01.

EMPIRE COTTON GROWING CORPORATION

SENIOR RESEARCH ENTOMOLOGIST. The Corporation, a research organisation concerned with basic work on all aspects of cotton growing, require an experienced entomologist to take charge of research on cotton pests at their principal Research Station near Kampala, Uganda (Director: Dr. J. B. Hutchinson, C.M.G., F.R.S.), and probably in due course to co-ordinate their entomological work in other African territories.

Salary, according to experience and qualifications, on a scale at present rising to £1,810 (including cost-of-living allowance).

Free furnished house. Leave in U.K. every two years. Free passages for officer, wife and all children under 18. Corporation's contribution to Staff Assurance Scheme, 26% of basic salary, employee's 5%.

Applications, with the names and addresses of two referees, to the Secretary, Empire Cotton Growing Corporation, 12 Chantrey House, Eccleston Street, London, S.W.1.

SITUATIONS VACANT

A NUMBER of interesting vacancies of various types available throughout Africa. International Situations, P.O. Umvuna, Southern Rhodesia.

DESIGN AND DETAIL DRAUGHTSMEN required, preferably with experience of agricultural machinery, tractors, etc. Five-day week, pension scheme, permanent positions with good salaries.—Reply, giving details of age, experience and salary required, to Box 5035.

TECHNICAL OFFICER, B.Sc. (Agriculture) or equivalent, required for an interesting and progressive post in the Technical Services Division of British Schering Ltd. Duties will involve literature research on product applications and the evaluation of new products and will include the initiation and progressing of field trials. Applications, giving full details of qualifications and career, may be forwarded to Technical Services Manager, British Schering Ltd., 229 Kensington High Street, London, W.8.

SITUATIONS WANTED

AGRICULTURIST with university degree and experience desires position with private enterprises in Pacific region or elsewhere. Research or developmental work preferred. 31 years of age, married, resident in Australia.—Box 5026.

DAIRY SHORTHORNS FOR MILK AND BEEF

Long Life – Regular Calving
Early Maturity

Ready conversion of home-grown feeding stuffs into quality milk on twice daily milking

Easily Managed

Literature and particulars from The Secretary, The Shorthorn Society, Victoria House, Southampton Row, London, W.C.1

SITUATIONS WANTED

WEED control specialist (British) seeks responsible post U.K. or abroad. Commercial and university research experience.—Box 5029.

GRADUATE in agriculture (M.R.A.C.) with wide managerial experience in England and tropics, now farming 1,000 acres, desires new appointment anywhere. —Box 5028.

An Official Car

Clients, Directors and other V.I.P.s cannot but be soothed in this elegant yet decorous car

•

THE MODEL TO BE USED FOR THE ROYAL TOUR TO AUSTRALIA, IT CAN SEAT 7 PEOPLE ALL FACING FORWARD

•

THIS POWERFUL HUMBER IMPERIAL HAS DONE ONLY 16,500 MILES (GUARANTEED) AND UPHOLSTERY AND RUGS ARE SPOTLESS
FITTED WITH MOST MODERN HEATER

•

This practically new magnificent car is for sale at half the new price—£1,000—in perfect mechanical order

To be seen in London at 8 Eden Street, N.W.1. Please address 'Car' World Crops

SITUATIONS WANTED

COCONUT and RUBBER PLANTER desires appointment, preferably Brazil. Agricultural Degree. Eight years' experience opening new plantations. Development work preferred with good future prospects. Age 33 years; married. At present employed in the tropics.—Box 5031.

ENGLISHMAN, 37, fully experienced plantation (copra and cocoa) management and development—industrial relations. At present sales executive for crawler and wheel tractors, agricultural and earth-moving equipment, seeks position either with plantation development company or with sales organisation handling general truck, car and machinery franchises, either Australia or overseas. Only position offering real scope and opportunity considered. T. Chambers, 18a Quinton Road, Manley, N.S.W., Australia.

FRENCHMAN (25), one year's training large English estate, four years' practical experience, two years Agricultural Institute; excellent references. Position as Bailiff or Assistant Manager.—Box 5034.

WANTED

SACKS AND BAGS WANTED, any quantity or type; carriage refunded; write for labels and best prices.—Irving Stewart & Co., Southend Road, Basingstoke, Hants.

ALL TYPES OF CLETRAC TRACTORS, any condition; state serial No. and price required.—C. J. Thorne & Co. Ltd., Lampool, Fairwarp, Uckfield.

G.M.C. 6 x 6 TRUCKS. Either complete or as spares. — Sworder (Motors), Lane End, High Wycombe, Bucks. Tel.: Lane End 234.

WANTED. Names of Estate Agents with orchard properties in the market for sale in the principal apple-growing districts in England.—Box 5032.

WANTED. Urgently required the following copies of WORLD CROPS: Vol. 1, January to December; Vol. 2, February, March, November; Vol. 3, February, August, December; Vol. 4, January, February, April, May, June. Reader willing to pay for copies sent.—Box 5027.

REPRESENTATIVES

AGENTS and Representatives to sell organic fertilisers required.—Box 5036.

BOOTS THE CHEMISTS have a few vacancies in retail branches for Agricultural Sales Assistants. Positions are progressive and may ultimately lead to appointments in representative capacity. Applicants must have sound knowledge of agriculture. Men aged 25 to 30 and single preferred. Applications to Retail Staff Department, Station Street, Nottingham.

SALES REPRESENTATIVE required for our north Lincolnshire business with extensive knowledge of complete range of tractors and farm machinery, particularly McCormick International. Applications by letter in first instance, giving full details of past experience, capabilities, etc., to Box 5037.

A YOUNG REPRESENTATIVE required by an old-established lubricating oil company. Following a probationary period on liberal commission, salary, commission and expenses will be paid with excellent opportunities for rapid promotion under expansion scheme now in progress. Full details, stating whether car owner, to Box 3636, Mason-Peacock Ltd., 184 Strand, London, W.C.2.

OUTSIDE REPRESENTATIVE for sound, progressive post, required by agricultural engineers handling Ferguson and other makes of farming equipment. Apply, giving full particulars of age, education, experience, etc., to Wincanton Garages Ltd., Bentley, Farnham, Surrey.

OWING to the retirement of an agent, we have a vacancy in the Brecon, Sennybridge, Llanwrtyd Wells, Builth Wells, area. There is a round of several hundred old customers and the position offers full scope and excellent earnings for a first-class representative. Applications will be treated in strict confidence and should be made, giving full particulars, to Box 5038.

SPECIAL OFFERS

ANALYSIS. Rapid Routine Analysis. Specialised Analysis. Ultimate Analysis. Assays. All Assays according to British Pharmacopoeia and Codex Bacteriological Examinations.—Write for particulars to Newchem Ltd., Poynton, Cheshire.

GRAIN STORAGE PESTS
CONTROLLED BY

TIFA

TODD INSECTICIDAL FOG APPLICATOR

FOGGING, SPRAYING, DUSTING

TIFA fog fills 15/20,000 cu. ft. of space in one minute
TIFA sprays apply residual deposits
TIFA dusts bagged grain
TIFA fogs infiltrate, penetrate and then KILL
TIFA eliminates the sealing of premises
TIFA is rapid, effective and economical

Write or telephone for particulars:

Lister-Todd Engineering Corporation Ltd.

Imperial House, 15-19 Kingsway, London, W.C.2
Telephone: TEMPLE BAR 0721

CLASSIFIED ADVERTISEMENTS

SPECIAL OFFERS

CARBONATE OF LIME. We can offer Carbonate of Lime in the form of screened chalk (specification 80% calcium carbonate, 100% passing a ¾ in. sieve) at 16s. per ton in bulk free on ship South of England ports; also a first-class delivery and spreading service for all types of lime throughout Scotland and in most counties of England.—All enquiries to Adam Lythgoe Ltd., Culcheth, Warrington, Lancs. Tel.: Culcheth 2271 (5 lines).

THE Sholderhi and Vertiswing Loaders, designed for permanently fitting to all makes and types of road vehicle. The Sholderhi for lifting all goods packed in closed sacks or bags from the ground to the height of a man's shoulder standing on the vehicle. The Vertiswing for loading all goods that must be kept upright, such as open coal bags, milk churns, fragile goods, carboys, etc. Both cradles will lift a maximum weight of 3 cwt. at one time.—A. J. Mackaness Ltd., Billing, Northampton.

LIGHT and Power anywhere—Powerco, robust, hard-wearing, self-contained, Diesel Electric Plants, including power take-off to drive other machinery, 1.25 kVA to 25 kVA, from £168. Price list, catalogue per return. Over a decade of engineering experience behind.—Powerco Ltd., Wandsworth Town Station Works, York Road, London, S.W.18. Cables "Powerco, London."

FOR SALE

DUSTS or Carriers, use our Airfloated BALL CLAYS, very adherent, great spread, with Brownian Movement, low price, samples.—Henshaw & Co., 97 Clearmont Road, Weymouth.

LAND ROVER. The distributors and specialists can offer immediate delivery of 1949 and 1950 models.—Arnold G. Wilson, Ltd., 232 Harrogate Road, Leeds, 7. Tel. 41014-5.

WEEKS' Spraying and Dusting Machines for all crops.—W. Weeks & Son Ltd., Maidstone, England. Established 1742.

REPLACEMENT ENGINES, fully reconditioned, are available as follows: Wisconsin VE4 for New Holland baler, Wisconsin VF4 for M.M.69 combine harvester, Meadows four-cylinder 28-h.p. for M.M. G.8 combine harvester, KEF for M.M. Model U tractor; full particulars on request.—Sale Tilney (Agricultural & Industrial) Ltd., Barkham Road, Wokingham, Berks. Tel. Wokingham 910.

LANZ IS BACK. Lanz string straw and hay stationary balers are now available and offer exceptional value. Fully automatic, supplying compact, tidy, well-separated bales of uniform adjustable size, foolproof, never-failing knotters; bales conveyed to any reasonable height without extra power. Write for full details to-day. H. Leverton and Co., Ltd., Sole Importers, Spalding, Lincs. Phone 3221.

TYRES!!! New, remould, ex-W.D., all sizes to suit all requirements.—H. Matthews, Ltd., Tyre Factors, 89-97 Stockwell Road, London, S.W.9. Tel.: Brixton 2026.

ELECTRIC MAINS WELDERS, operate from 20 amp. meter, any voltage, £55 with condenser, etc. Demonstrations daily.—Production Promotion, 94 Camden Road, N.W.1.

FOR SALE, A.E.C. Matador TRACTOR with 20-ton Low-loading Trailer; also A.E.C. Matador with 16-ton Low-loading Trailer. For particulars and price apply Contractors (Manchester) Ltd., Greg Street, Reddish, near Stockport, Cheshire.

PUMPS. New Government surplus diaphragm lift and force for liquid manure, cesspools, sludge, water etc;. 2-in. inlet and outlet; 950 g.p.h. Immediate delivery; £5 12s. 6d. Hose also in stock. Sterling Pump Co. Ltd., Spalding. Tel. 2404.

JEEPS, reconditioned throughout, 20-23 m.p.g.; guaranteed 6 months; luxurious utility; all original spares stocks.—Metamet, 100 Belsize Lane, N.W.3. Hampstead 8231-2.

AIR COMPRESSORS for spray painting, disinfecting and radiator blowing, tyre inflation, creosoting, whitewashing, etc., on farm or estate. Send P.C. for complete details to Dept. 5, B.E.N. Patents Ltd., High Wycombe, Bucks.

TALC POWDER. Suitable for Fungicide Dust. Packed 1 cwt. bags, ex stock.—H Lloyd & Co., 31 Basinghall Street, London, E.C.2.

FIRE!
FREE BOOKLET FOR YOU ON
NU-SWIFT!

Fascinating, new, multi-coloured brochure, "Fire!—Your Dangerous Servant," can be yours. It tells you why to get Nu-Swift before your fire risk becomes 3-dimensional. Send for it—NOW!
NU-SWIFT LTD · ELLAND · YORKS
In Every Ship of the Royal Navy

FOR SALE

FERGUSON Tractor Owners should fit a Wallace Sideland Adjusting Lever to their tractor ploughs; instant adjustments can be made on Sideland without leaving tractor seat. Available for Ford/Ferguson single- and double-furrow ploughs and Standard Ferguson single- and double-furrow ploughs. Price £5 10s., carriage paid.—Full particulars from John Wallace & Sons (Ayr), Ltd., Townhead Works, Ayr. Tel.: Ayr 5018/9.

POWER-DRIVE and Wheel-drive Manure Spreaders available, prompt delivery.—Salop Trailer Co., Ltd., Shrewsbury.

JEEPS. New and reconditioned in stock, amphibious Jeep spares.—Davies & Groves, 1-5 Dorset Close, N.W.1. Tel.: Pad. 8345. Established over 100 years.

WHEELS and TOOLBARS for most tractors, including underslung and rear type with independent steerage for Allis-Chalmers "B," sack lifter for Horndraulic loader. Miller Wheel & Cultivator Co. Ltd., Chelsfield, Kent.

THE RAPIDCUT HEDGE TRIMMER. The proved machine for the quickest and most efficient cutting and trimming of hedges from one to 50 years' growth. Full details from makers, J. Foster & Co. Ltd., North Cave, East Yorks.

SPRAYING MACHINERY—for washes, dusts, weed-killers, creosote, disinfectants, limewash, etc. There are machines for small or large growers, including small hand machines, knapsack and pneumatic knapsack sprayers, high-pressure hand power machines, power sprayers with auxiliary engines or power take-off. Tank capacities from 3½ pints to 350 gal. Prices 72s. 6d. to £800. IMMEDIATE DELIVERY. Catalogue from Cooper, Pegler & Co. Ltd., P.O. Box No. 9-78, Burgess Hill, Sussex.

BARGAIN
FOR SALE

Immediate shipment from Alexandria or Port-Said (Egypt)—

1000 TONS BLACK POTASH ASH

(Deriving from Sugar Molasses)

25-28% K_2O

Packing in sound second-hand jute bags of 100 Kgs.

Cable or write
MOISE LEVY
7, Bd. SAAD ZAGHLOUL, P.O.B. 1494
ALEXANDRIA, EGYPT
Cable: MOLVY, Alexandria

MISCELLANEOUS

TARPAULIN SHEETS. All sizes, fully reconditioned and re-roped tarpaulins at low prices. Please send us your enquiries.—Turner's Tarpaulins, Queen Street, Denton, Manchester. Phone Denton 2804.

SAWBENCH. 30-in. blade. Dual-purpose portable (crosscuts and rips). Tractor mounted.—Grays of Fetterangus, Scotland.

LAND ROLLER. Mounted hydraulic, 6 9, 13½ ft. models. Fits all tractors.—Grays of Fetterangus Scotland.

FOR SALE, Muir-Hill, Model 45, Supalift LOADING SHOVEL, ¾ cu. yd. Bucket. Manufactured 1944. Just been rebuilt, including new engine. Offers.—F. Shepherd & Son Ltd., Plant Department, Blue Bridge Lane, York. Tel. 4872.

FOR SALE, Sykes 8 in. PUMP with Ruston 30 h.p. Diesel engine, with three 20-ft. delivery pipes and attachments. £350, or would hire.—H. Wimpenny & Sons Ltd., Gardner Road, Prestwich, Lancs.

SMITH'S TRUCKS—of course, for the cowhouse, dairy and many other farm purposes. Write for lists to—G. C. Smith (Coachworks), Long Whatton, near Loughborough, Leics. 'Phone: Hathern 291/2.

LIGHTS on your Fordson tractor, only £5 7s. 6d; complete dynamo lighting set, including headlamps, etc. (nothing more to buy); easily fitted in one hour. New and guaranteed; carr. 2s. 6d. extra.—Tractorlights King's End, Bicester, Oxon.

HEDGE Clearing, Levelling, etc. Best and cheaply with a Muledozer on Fordson Major or Nuffield. Rotaped tracks solve all traction problems on bad ground. Ask your dealer for particulars.—Leeford (London), 33 Upper Brook Street, London, W.1.

TITANINE AGRICULTURAL ENAMEL, as supplied to leading tractor and implement manufacturers is available in all standard shades for immediate delivery. Write to: Titanine, Ltd., Colindale, London, N.W.9.

INVEST in a Gunsmith, the economical Light Tractor which pays for itself over and over again. Basic price £185 ex works. Full particulars from World Distributors Farm Facilities Ltd., Dept. W., Kings Grove, Maidenhead. Telephone 3421/2. Cables 'Farfac Maidenhead.'

STACK COVERS, new, made complete with double-sewn seams, fitted strengthened patches and eyelets, with extra long and strong tie-cords. All complete for immediate use. Ex stock. Carriage paid English and Welsh stations only. Cash with order.

	7×6	8×6	10×8	12×10 yds.
Plain Jute ..	136/6	156/–	260/–	390/–
Green Jute ..	185/6	212/–	353/3	530/–
Green Cotton ..	325/6	372/–	620/–	830/–

Also Tarpaulins, Thresher Covers, etc. Write for free samples and price list from the Actual Makers.—Potter Bros., Dept. B, Shrewsbury. Tel. 2256.

FARM AXLES with Wheels and Tyres, with or without brakes.—Used Units Ltd., Woone Lane, Clitheroe. Tel. 45.

AERO TYRES. 650 × 5½, 750 × 10¾, 800 × 10, 725 × 9, 750 × 10, 1,000 × 5¼, 1,250 × 10, 900 × 15.—City Tyre Service, St. Giles, Norwich.

FIRE HOSE. Heavy canvas, rubber lined, standard 2½ in. internal diameter (4 in. wide flat). Will stand very rough usage, 45s. per length 48 ft. Hose Clips, 18s. 9d. per dozen. Large stocks, immediate despatch.—Foundation Oil Co., Ltd., 8 Orford Hill, Norwich.

LONG RABBIT NETS. Catch your rabbits in large numbers with these nets. Instructions sent with each net. Also useful when cutting corn. Best materials. Tan or Green, fitted lines, 3 ft. to set 150 yds., 12s. 6d.; 100 yds., 8s.; 75 yds., 6s.; 50 yds., 4s. 6d.; 25 yds., 2s. 9d. (post paid). Long net supports; set net during the day and drop after rabbits are out; for details see special leaflet. Coil-spring Rabbit Traps, our usual best quality, 48s. dozen, 25s. half-dozen. Sample trap, 5s. (post paid). Rabbit Snares, best 8 strands, wire, fitted cords, per gross, 22s.; 6 dozen, 11s. 6d.; sample dozen, 2s. 6d. (post paid). Stout ash Snare Pegs, 13s. 100; 2s. 3d. dozen. Six-strand Snares, 2s. gross cheaper. Also Snares for foxes, badgers, hares and vermin traps for rats, moles. Automatic Traps for mice, sparrows, fish and eels. Sawyer humane Rabbit Traps, Alarm Guns, Automatic Scarers, Ferreting and Trapping Tackle, Twines, Purse Nets, Snare Wire. Poultry appliances all kinds. Catalogue free.—Young's Ltd. (W.C.), Net Makers, Misterton, Somerset. Tel.: Crewkerne 161.

★ Advertisers are asked *not* to send coins and notes when paying for advertisements. Payment should be made by **cheque** or **postal order**, payable to LEONARD HILL LTD., and crossed.

★ Applicants, when replying to Box Nos., should address: 'BOX No., etc., "WORLD CROPS," STRATFORD HOUSE, EDEN STREET, LONDON N.W.1.'

NEW LIGHTWEIGHT (Plastic)

PULSAFE FACE SHIELD P.E.14

Light, comfortable and sturdy, this new face shield is now used as part of the protective clothing worn by those workers in the agricultural industry engaged in the spraying of crops.
There is a wide range in sizes and despite the shield's protective strength it can be worn the day long by female as well as male workers.
When not in use the face shield swivels above the head. All component parts of the shield are easily replaceable.

Write for full details of the complete Pulsafe range.

SAFETY PRODUCTS LTD. 44 HATTON GARDEN, E.C.1. HOL. 5240

SPRAYING AND DUSTING MACHINERY

For the dusting of Cotton, Rubber, Citrus and all crops

The 'PULVOVER' Power Duster with 10-row adjustable lance for Ground Crops.

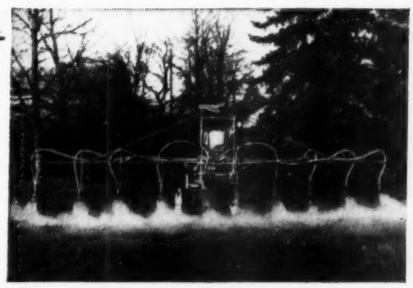
Capacity 150 lbs. Distribution from 35 to 630 lbs. per hour.

The following are made and stocked for IMMEDIATE DELIVERY — Hand Sprayers — High Pressure Hand Power Machines — Powder Sprayers Hand or Engine driven — Knapsack and Pneumatic Knapsack Models — Power Sprayers with Auxiliary Engines or Power take-off — Dust Guns, etc.

Tank Capacities from 3½ pints to 350 gallons — Outputs from 3 to 450 gallons per hour
Pressures from 25 to 570 lbs. per square inch

Catalogue from :

COOPER, PEGLER & CO. LTD.
P.O. Box No. 9-78 · BURGESS HILL · SUSSEX



The 'PULVOVER' High Power Duster

The AGRICULTURE *of* THE SUGAR-CANE

A. C. BARNES, C.M.G., B.Sc., F.R.I.C.

DEMY 8vo 392 PAGES **CONTENTS** **42s.** net plus postage 8d. U.K., 1s. 2d. abroad

Introduction. The Sugar-cane, a Major World Crop. Soil, Climate and Rainfall. Drainage of Sugar-cane Lands. Pests and Diseases, their Incidence, Effects and Control. Sugar-cane Varieties and Plant Breeding. Plantation and Field Planning. The Planting and Culture of the Cane. Manures, their Application and Effect. The Maintenance and Improvement of Soil Fertility. Irrigation. Weeds, their Control and Eradication. The Crop Cycle—Plants and Ratoons. The Mechanism of Sugar-cane Agriculture. Reaping, Loading and Transport of the Cane. Management, Supervision and Accounting. Field and Farm Records. Planters' Organisations. Research and the Planter. Sugar-cane as an Industrial Raw Material. Prospects and Practice in the Future. Appendices —Tables and Miscellaneous Data of Use to the Planter. References to Literature. Index. Numerous illustrations, including diagrams.

This work is an authoritative practical manual based on extensive agricultural, administrative and research experience.
The development of sugar-cane agriculture will be traced, modern practice described, and future possibilities discussed.

If you will forward your order now, we shall be pleased to supply a copy.

Published by

LEONARD HILL LIMITED, 9 EDEN STREET, LONDON N.W.1

The science of plant protection

Swap you?

This is the way to a peaceful world. But supposing these children have no food to exchange? Insect pests, weeds and diseases snatch, every year, more than 30% of the world's food crops. Wherever they leave nothing to swap, hunger and strife result. Plant Protection Ltd with its parent company I.C.I. is in the thick of the world-wide fight against these enemies of the crops.

Visitors from abroad are welcome at Plant Protection's Fernhurst Research Station where the world's first selective weedkillers and insecticidal seed dressings were tried out. If you would like to see 'Plant Protection' at work or seek further information about 'Plant Protection' products please write to Room 50, Plant Protection Ltd, 61 Curzon Street, London, W1.

Plant Protection Ltd

Weed Control...

cheaper and more efficient with Monsanto chemicals

(Above) Heavy infestation of nutgrass in Jamaica, before spraying.

(Left) Same area, nutgrass controlled by 1 application 2,4-D Dimethylamine salt, equivalent to 2¼ lbs. 2,4-D acid per acre.

Sugar-cane growers in the Caribbean, using Monsanto chemicals, report up to 30% savings in weeding costs, and these other advantages . . .

★ One pre-emergence treatment allows cane seedlings to germinate and grow for 4-6 weeks without weed competition.

★ Spraying is easier, cheaper and faster than hand weeding.

★ Damage to young cane is avoided. Hand-weeding may damage 15-20% of young plants.

★ Chemical sprays do not disturb the soil, kill weeds near the surface. Weeds cannot revive later.

★ Chemical control is effective against wide range of weeds, including certain noxious species not controlled by hand-weeding.

Monsanto chemicals for treatment of weeds in sugar cane include:

Hormone-type weedkiller.	
Hormone-type weedkiller, especially effective against nutgrass and especially formulated to prevent nozzle blockage.	Contact weedkiller.
	Contact weedkillers.

Full information, including literature and advice on specific problems, from Sales Division.

MONSANTO CHEMICALS LIMITED,

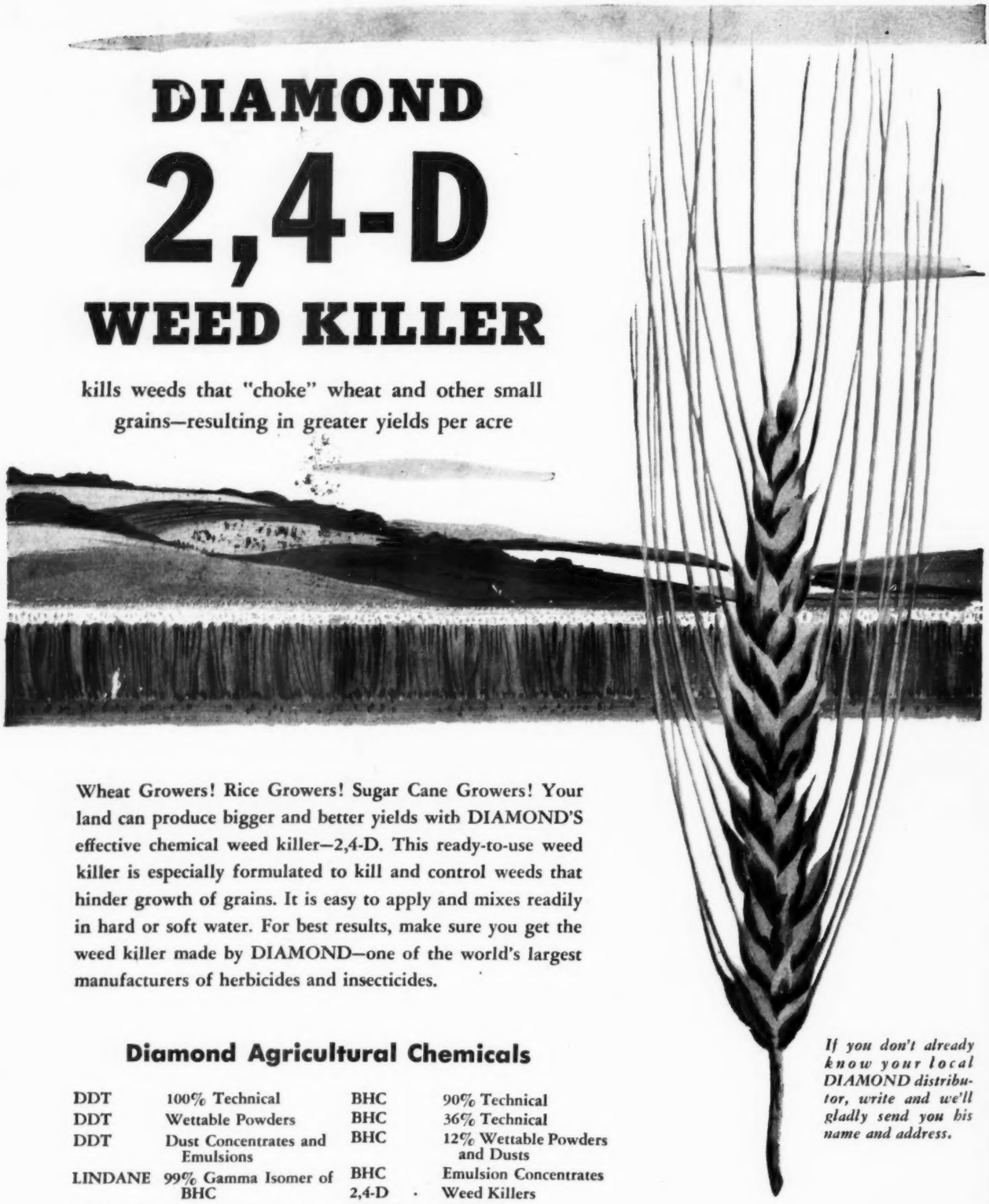
Victoria Station House, Victoria Street, London, S.W.1.

Monsanto Chemical Company, St. Louis, U.S.A. Monsanto Canada Ltd., Montreal. Monsanto Chemicals (Australia) Ltd., Melbourne. Monsanto Chemicals of India Ltd., Bombay. Monsanto-Atanor Industrias Quimicas Argentinas S.A., Buenos Aires. Monsanto Mexicana S.A., Mexico. Monsanto-Kasei Kogyo K.K., Tokyo, Japan. Representatives in the world's principal cities.

MONSANTO

DIAMOND
2,4-D
WEED KILLER

kills weeds that "choke" wheat and other small grains—resulting in greater yields per acre



Wheat Growers! Rice Growers! Sugar Cane Growers! Your land can produce bigger and better yields with DIAMOND'S effective chemical weed killer—2,4-D. This ready-to-use weed killer is especially formulated to kill and control weeds that hinder growth of grains. It is easy to apply and mixes readily in hard or soft water. For best results, make sure you get the weed killer made by DIAMOND—one of the world's largest manufacturers of herbicides and insecticides.

Diamond Agricultural Chemicals

DDT	100% Technical	BHC	90% Technical
DDT	Wettable Powders	BHC	36% Technical
DDT	Dust Concentrates and Emulsions	BHC	12% Wettable Powders and Dusts
LINDANE	99% Gamma Isomer of BHC	BHC	Emulsion Concentrates
LINDANE	Emulsions, Wettable Powders, Dusts	2,4-D	Weed Killers
		2,4,5-T	Brush Killers
		K-101	Miticide

If you don't already know your local DIAMOND distributor, write and we'll gladly send you his name and address.

DIAMOND ALKALI INTER-AMERICAN CORPORATION

122 East 42nd Street, New York 17, N. Y., U.S.A.
Cable Address: DIAMALKALI

DIAMOND ALKALI CHEMICALS

Printed for the Proprietors, LEONARD HILL LIMITED, and published by them at their Offices, Stratford House, 9 Eden Street, London, N.W.1 by F. J. Parsons, Ltd., London and Hastings, England.
Registered for Transmission to Canada, including Newfoundland.